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ABSTRACT

This report describes two alternative approaches to measuring resources in K-12 education. One approach relies heavily on traditional accounting data, whereas the other draws on detailed information about the jobs and assignments of individual school personnel. It outlines the differences between accounting and economics and discusses how each approach will influence the level of analysis. The report illustrates what kinds of information can be ascertained from each of these approaches to measurement and describes the advantages and disadvantages of each. The document describes the uses of accounting data, such as uses of central-office expenditures, to develop common measures of resources. It addresses conceptual issues and illustrates how various kinds of resources data may be used to answer specific questions about the patterns of resource allocation. It outlines the Resource Cost Model and applies it to personnel expenditure by position and explores the patterns of variation in resources and the costs of service delivery. The report is intended to provide information to the National Center for Education Statistics in considering its role in organizing and collecting information about resource allocation in K-12 public and private schools in the U.S. (18 tables provide further information. Contains 20 references.) (RJM)

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Working Paper Series

Measuring Resources in Education: From Accounting to the Resource Cost Model Approach

Working Paper No. 1999-16 June 1999

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Measuring Resources in Education: From Accounting to the Resource Cost Model Approach

Working Paper No. 1999-16 June 1999

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Foreword

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Measuring Resources in Education: From Accounting to the Resource Cost Model Approach

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June 1999

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I. Introduction

This report describes two alternative approaches to measuring resources in K–12 education. One approach relies heavily on traditional accounting data, while the other relies on detailed information about the jobs and assignments of individual school personnel. The goal of this report is to illustrate what kinds of information can be ascertained from each of these approaches to measurement, and to describe the advantages and disadvantages of each. The report addresses conceptual issues and presents empirical examples of information derived from each approach, and it provides some illustrations of how various kinds of resource data may be used to address specific questions about the patterns of resource allocation. The report is intended to provide information to the National Center for Education Statistics (NCES) in considering its role in organizing and collecting information about resource allocation in K–12 public and private schools across the United States.

Background

In the mid-1960s, it was quite common for educational spending data to be reported by object of expenditure (e.g., teachers, aides, principals, supplies, and materials). Such data may have been adequate in an era when education was a much simpler enterprise. However, with the expanding role of education in providing related health, nutritional, and social services and the concern that fewer dollars were

being devoted to direct instructional services, there has been an increasing tendency to report expenditures by functional categories such as instruction, instructional support, administration, and operations. There has also been an increasing interest in understanding how much of the educational tax dollar has been expended on what has become known in some circles as the administrative blob.

Moreover, with the recognition of a number of special need populations (e.g., students with disabilities, limited English proficiency, or economic or educational disadvantages) and the increasingly categorical nature of the educational enterprise over the past three decades, there has also arisen an interest and need to understand how educational spending is allocated among the major program areas which have arisen to meet these special needs. With the entitlements provided to certain special need populations — notably special education — and the apparent growing costs of special services, concern has also increased about the extent to which funding reaches general education services. Administrators, policymakers, taxpayers, and parents all want and need to know how much of the education dollar is being allocated and expended on general education, special education, programs for limited-English proficient children, compensatory education, vocational education, gifted and talented education, and early childhood education.

Finally, these various constituencies also want to know what they are getting for their expenditure of funds. What are the relationships between what goes in (i.e., the resources invested) and what comes out of the system (i.e., student outcomes or social benefits)? What resources are being devoted to the system and how are these

measured? And what are the student outcomes or social benefits derived from this investment?

Reporting expenditure data by object was once meaningful and useful in an era of less complex social and educational policy. However, in today's more complex policy environment, expenditures categorized by the objects on which they are expended (e.g., salaries and benefits of teachers, aides, and principals or instructional supplies and materials) become important only within the context of the functions they serve (e.g., instructional, administrative, or support) and the special programmatic needs they address (e.g., the needs of disabled or limited-English proficient children). Moreover, for understanding questions related to educational productivity, it may also be important to ascertain how resources are organized for service delivery.

A critical function of NCES is to produce *useful and meaningful* statistics related to the patterns of resource allocation in local education areas, or LEAs. But what does it mean for data to be useful and meaningful? First, data compatibility is an important dimension. For example, the growth of special education over the past 20 years has generated a great deal of interest in obtaining an accurate estimate of how much is being spent on special education relative to general education programs, and a number of researchers have tried to make estimates.[1] With the significant interest in knowing how much is being spent on different educational programs around the nation, it is critical that the same standards and definitions be used in reporting the data over time or across political boundaries such as districts or states.

[1]See, for example, Chaikind, Danielson, and Brauen (1993) and Parrish (1996).

Second, to be useful and meaningful, data on patterns of resource allocation must convey information that can help policymakers consider ways to improve educational productivity and equality of opportunity. This means that the ways of classifying, organizing, and measuring resources should contribute to understanding their impact on student outcomes.

Purpose of this Report

The desire for programmatic cost information, the need for data compatibility, and the importance of understanding the relationship between educational inputs and outputs all point to a need for improving the standards for organizing and reporting educational resource data. This is precisely one of the significant roles for NCES. This report strives to contribute to the process of formulating such reporting and measurement standards. More specifically, the purpose of this report is to provide a foundation for improving resource measurement in education and illustrating the implications for how such data should be collected from states, districts, and schools. This report addresses the following questions:

- What are the alternative ways of measuring resources in K–12 public education?
- How can this information be used to inform policymakers about issues related to student needs, educational productivity, and equal opportunity?

This report focuses on two approaches to measurement of resources in education: an accounting approach and a resource-based approach. The accounting approach measures resources in dollars of expenditure. While the accounting approach has been the standard for years, it is perhaps best represented in the recent article by Coopers and Lybrand (1994) in which they apply the Coopers-Lybrand Finance Analysis Model (FAM) to the analysis of the budget in New York City.[2] Much of the emphasis in this application involves moving from the district to the school and, ultimately, to the classroom level of analysis and increasing the level of precision with which one delineates administrative and support services.

The resource-based approach emphasizes the measurement of resources in terms of physical ingredients to the greatest extent possible and is largely based on the concepts and methods put forth in previous work of Levin (1975), Hartman (1979), and Chambers and Parrish (1982a, 1982b, 1994b,1994c, & 1994d) on the *Resource Cost Model (RCM)*. The resource-based approach also builds on the analysis and recommendations of Berne and Stiefel (1995).

The comparison of the accounting and the resource-based approaches explores the differences in the way accountants versus economists view the concepts of cost and expenditure. If there is a bias in the analysis, it lies in the emphasis that is placed on the relationship between the way data on educational resources are organized and reported and the ability to understand and measure implications for educational productivity and student needs. While little attention *per se* is given to outcomes in

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[2] The Finance Analysis Model has also been referred to as *INSITE* in more recent advertisements of the Fox River Learning model.

this report, the ultimate goal is measurement of resources in a way that can help policymakers sort out what makes a difference in schools.

This report focuses on the development of a framework for organizing and analyzing programmatic cost, expenditure, and resource data for local educational agencies serving elementary and secondary students. The report examines the role of raw measures of educational inputs (e.g., full-time equivalent staff or staffing ratios) and their relationship to costs and expenditures. The report also suggests approaches for measuring programmatic resources and for addressing the interrelationships between services at different levels of the schooling enterprise (i.e., the student, the classroom, the school, and the district) and the outcomes of the services. While the analysis does not involve a comprehensive study of educational inputs and outputs, measuring programmatic costs and expenditures must consider the ways in which resources are allocated for the purposes of producing outcomes. It is a matter of attempting to organize data in a way to increase understanding of school and district behavior and the impact it has on the outcomes of the schooling enterprise.

Organization of this Report

Chapter II examines alternative approaches to database development and draws attention to the differences in perspective, purpose, and role of the accountant versus the economist in this process.

Chapter III describes how patterns of resource allocation are commonly reflected through accounting data. Data for this analysis are derived from an

accounting system maintained by the Ohio Department of Education (ODE). A series of tables has been created to illustrate some of the kinds of questions that can be addressed with these different types of data. This chapter focuses on dollar measures of resources and what they convey about resource allocation.

Chapter IV builds a personnel database from ODE personnel data systems and illustrates the differences and similarities in the way these data are organized in comparison to the accounting data. This chapter begins to introduce the notion of measuring resources in physical ingredients rather than just dollars of expenditure.

Chapter V illustrates how breaking expenditures down into their component parts can provide valuable insight into the patterns of resource allocation. A series of indexes is developed using the personnel data to show how variations in expenditures can be broken down into variations in the quantities, qualities (or characteristics), and costs of resources.

Chapter VI introduces the service delivery system as a unit of analysis and shows how resources (i.e., specifically personnel in this case) are linked to students. This is accomplished by linking staff data with course schedules for both staff and students. In this chapter, expenditures are linked to staff time, instructional time, and students served. This represents a major step toward development of a full RCM database.

Chapter VII presents a summary of the report, a discussion of some of the problems encountered in the development of the accounting and personnel databases, and some ideas for future research.

II. Accounting Versus Economics: a Difference in Goal and Perspective in Database Development

Introduction

There has been a longstanding division in educational research on fiscal, curricular, and assessment research. This division largely is a result of the different disciplinary and methodological skills and the different programmatic knowledge base required to study these issues. However, success in understanding the relationships among educational inputs, processes, and outcomes will only come when these strands of research can be conducted in collaboration. Such collaborative work requires developing ways of linking the different measurement tools used across disciplines to evaluate student performance, assess curricular processes, and quantify resources. Unfortunately, even within the specific lines of research, there are differences in disciplinary and methodological perspectives that affect measurement.

In the past three decades, school finance research and educational policy analysis have increasingly been organized around concepts such as *accountability*, *efficiency*, *adequacy*, and *equity*. These terms emerge in the context of the literature on school reform, school finance, school reorganization, and educational program evaluation. Policymakers and policy analysts constantly seek new information that will provide insights into the relationship between educational inputs and outcomes. But, specifically, what kind of information is required to understand and explain the

patterns of resource allocation and the relationship between the inputs and outcomes of the system? What is meant by resource allocation? What levels of detail are required to maintain a database for addressing issues of accountability, efficiency, adequacy, and equity? How do we define such concepts as adequacy and equity? What are the appropriate techniques for measuring resources to address these issues?

This chapter provides an example of the differences in resource measurement tools that have resulted from the different disciplinary perspectives of accountants and economists. It presents an overview of two models that illustrate some of the differences in the perspectives and motivations of the accountant and the economist. The Coopers-Lybrand Finance Analysis Model (FAM) reflects the perspective of the accountant, where resources are primarily measured in terms of dollars and data are organized by objects of expenditure, functions, and programs. The *Resource Cost Model* (RCM) typifies the perspective of the economist, where resources are measured whenever possible in terms of physical ingredients and are organized in terms of service delivery.

The Accountant's Perspective: Coopers-Lybrand Finance Analysis Model (FAM)

Fiscal or accounting data are most commonly reported by object of expenditure (e.g., salaries, benefits, supplies and materials, capital), function (e.g., administration or instruction), or program (e.g., regular versus special education). Furthermore, fiscal data available from most states are reported at the district rather than school level. Since the school is actually the location where services are

produced, aggregation to the district level makes it impossible to assess the patterns of variations in the levels and costs of services to children of different ages and exhibiting varying needs.

In the 1960s and '70s, fiscal data were most commonly reported by object of expenditure with little reference to functional or programmatic categories. In the past two decades, it has become more common for fiscal data to be reported in broad functional categories such as instruction, administration, or operations and in programmatic categories such as general, special, or vocational education. However, fiscal data systems rarely provide sufficient linkages between funds expended and the children served. That is, it often is not easy to determine which children are receiving which kinds of services. While the categories of children served may be identified by virtue of the coding structure, the fiscal data systems themselves rarely include the actual counts of children being served, and they generally are not linked in systematic ways to the databases that contain these child counts. Moreover, these fiscal data systems generally do not indicate the mechanisms for service delivery to children.

The U.S. Chamber of Commerce, the accounting firm of Coopers and Lybrand and Fox River Learning have introduced a software package designed to address some of the current problems with existing fiscal data systems for the educational market. It has been referred to under two names: the Finance Analysis Model (FAM) or IN$ITE. It runs on a personal computer and is intended to provide a tool for organizing school fiscal information so that school district officials and others can determine how educational dollars are being spent. It is not intended to replace accounting systems, but is rather superimposed on top of existing school district accounting systems.

Implementation of FAM within a school district involves recoding and reorganizing information contained in a school district's general ledger into a detailed set of functional, program, and grade level (i.e., school type) categories. The five functions include the following:

- Instruction
- Instructional support
- Operations
- Other commitments
- Leadership

The programs recognized within the model appear to include the following five categories:

- Regular education
- Special education: full-time
- Special education and related services
- Bilingual education
- Other categorical programs

A significant contribution of FAM is an emphasis on coding expenditure data to the school site. It attempts to attribute or allocate expenditure to the greatest extent possible to the school site. That is, FAM attempts to ascertain the extent to which services are rendered at the school site and then to allocate expenditures accordingly. This is an important advance over the district level information that is commonly reported to the states through their uniform school accounting systems.

According to Sheree Speakman of Coopers and Lybrand, the process of installing the software and mapping the existing account ledger into FAM coding structure may require a few weeks on a one-time basis.[3] For example, application of FAM to the New York City school system required three individuals approximately 12 weeks to map. An unidentified, but considerably smaller school system required about three weeks. Beyond this installation component, FAM requires involvement of a local advisory committee over a period of one to three months to review information and educate various constituencies about the new structure.

What does FAM do well? It provides a mechanism for conveying information on how educational dollars are being spent. When properly implemented, FAM has the potential to provide compatible data across jurisdictions so that meaningful comparisons can be made. It divides expenditures into broadly meaningful categories of expenditures that can be related to the numbers of students served. The compatibility is achieved because the structure for organizing expenditure information is supposed to be well-defined and fixed across school systems. Moreover, based on the statements made by Speakman, the initial implementation of the framework requires a relatively modest up-front cost for individual school districts.

It purports to superimpose itself on top of existing accounting structures, saving districts or the state from investing in a new system. Yet, FAM does require the development of an extensive cross-walk between the existing accounting system and the framework approved for use under FAM. Thus, the comparisons across jurisdictions or schools that might be made using the FAM data are only as good as

[3] This information is based on responses to questions during a press conference held on February 23, 1995, in Washington, DC., by the Center for Workforce Preparation/Coopers and Lybrand L.L.P., School Finance Seminar.

the coding structure and the cross-walk that produces them. Depending on the integrity of the original data and the detail with which it is recorded, the cross-walk potentially requires many decisions about how data are to be coded and allocated among programs, levels, and sites. It requires the development of a series of decision rules or formulas for reallocation which may or may not resemble the underlying factors that affect marginal costs of a given service.

One significant problem arises in implementation of FAM when the original accounting data do not resemble in any way, shape, or form the structure of FAM. The greater the number of decision rules and reallocation formulas that are used to cross-walk the data from the existing system to the FAM framework, the greater the likelihood for misrepresentation of the data and the more difficult it is to compare across jurisdictions. For FAM to be most effective, the underlying accounting system must be fairly detailed in its structure and must already fairly closely resemble the FAM structure.

Nonetheless, an advantage of FAM is that it incorporates a defined set of decision rules and formulas that are used for reallocation of expenditure data among various categories, and these decision rules are built into the software that supports the model. Thus, the potential for developing compatible data across sites is clearly one goal of the system.

In addition, FAM is comprehensive in accounting for all of the expenditures of a school district. In fact, the software requires that all dollars are properly reallocated within the context of FAM.

The FAM allocates fringe benefits on a fixed percentage by category of employee. Each category is assigned a fringe benefit percentage. This clearly is a vast improvement over many school accounting systems which often do not allocate fringe benefits to the employees for whom they are paid. Fringes are often assigned to the district level because of the difficulties that sometimes occur in assigning them to individuals within the accounting systems.

However, assigning a fixed benefit rate to broad categories of employees can also distort costs. In fact, even within specific categories of employees such as teachers, fringe benefit rates can vary substantially because salaries vary substantially. The variation in fringe benefit rates results from the composition of benefits: a portion of the benefits is in the form of lump sum payments (i.e., fixed amounts per employee), while the other portion of benefits is paid as a fixed percent of salary.[4] It is important to point out that this is not necessarily a problem that is unique to

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[4] For example, consider the benefit rates of teachers at different points in the salary scale. Suppose that the district contributes $5,000 per teacher per year for health insurance. In addition, assume that the district and/or state contributes the same percentage of salary (say, 15 percent) for all employees to cover retirement contributions, unemployment insurance, workers compensation, and other payroll taxes. If teachers' salaries range from $20,000 for a starting teacher to $40,000 at the top of the salary scale, then the benefit rates for each category of teacher may be calculated as follows:

Benefit rate = $(L + r \times S)/S$

L = *Lump sum contribution by the district per employee for health insurance;*

r = *proportionate rate of salary for payroll taxes and retirement contributed by the district (e.g., 15 percent is expressed as 0.15);*

S = *Annual salary*

Benefit rate for starting teachers earning $20,000 per year is 40 percent: that is,

$0.40 = (5000 + .15 \times 20000)/20000$

Benefit rate for teachers at the top of the salary scale at $40,000 per year is 24 percent: that is,

$0.24 = (5000 + .15 \times 40000)/40000$

This analysis shows that using a fixed percentage of salaries applied to all personnel even within a single labor category can result in a distortion of the real costs of fringe benefits.

accounting systems or FAM in particular. It is one that is quite commonly a problem that affects many of the fiscal or even *resource-based* reporting systems in the face of incomplete data on employee compensation.

Given the concern in recent years over the level of administrative expenditures (i.e., the so-called administrative blob) in education, FAM provides detail about how non-instructional costs are allocated among various administrative functions and sub-functions. This is an important and significant contribution in that it provides a more comprehensive picture of the diversity of activities and functions performed by districts and schools. These kinds of data help clarify the distinction between administrative functions and other functional categories necessary to support and maintain the operations of local school systems.

However, at the same time it breaks out administrative functions, FAM also aggregates the largest proportion of expenditures into one very large category called instructional teachers. For example, in a recent study of New York City schools, FAM shows that almost 48 percent of total educational expenditures is allocated to instruction, and more than 41 percent of total expenditures is allocated to instructional teachers. Thus, while the administrative blob has been broken down into its component parts, an instructional blob has been created in its place. To understand productivity in education, it is necessary to divide these instructional expenditures into smaller components.

While FAM does attempt to divide instructional services into those that derive from the classroom, even this delineation does not begin to reflect the diversity of services being offered to children. What kinds of classrooms are included? Where are

resource and other specialized teachers and therapists in this model? How are different kinds of subject matter treated in this analysis? The largest single category of expenditure in the K–12 educational enterprise is instructional expenditures, and yet it contains a great deal of diversity of services. It includes services such as self-contained classrooms, resource programs, departmentalized instruction in different subject areas (academic and nonacademic alike), and supplemental resources and services directed at special student populations — some identified by program and some not. Under FAM, instructional expenditures combine inclusionary services with segregated services for all children.[5] Thus, a resource program in which teachers pull children out of the regular classroom (a pull-out program) is treated the same as one in which the teachers provide supplemental services within the regular classroom (sometimes referred to as a push-in program).

While the foregoing discussion has focused on the specific features of FAM, many of the issues that arise in evaluating FAM are similar for most accounting systems. Data tend to be reported in fairly aggregated categories by object, function, and program. Data are rarely linked to the students served, though FAM has attempted to resolve this by including certain specific counts of students by program as part of the collection and organization of fiscal information.

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[5] *Inclusionary* services refer to instruction provided by specialists to special need populations within the regular classroom. *Segregated* services refer to services which are provided by specialists in an environment outside of the regular classroom and which are designed specifically for the special population involved (e.g., students who are economically or educationally disadvantaged or have specific disabilities). Segregated services can be provided in pull-out programs or special self-contained classrooms.

The Economist's Perspective: the Resource Cost Model (RCM)

A next step to increasing understanding of productivity and addressing cost-effectiveness in education requires more attention to the details of how services are delivered. It requires more of an economist's than an accountant's perspective. Specifically, it requires breaking down the large category of instructional expenditures into its component parts in order to sort out the factors that underlie variations in expenditures across local jurisdictions and to determine how these factors systematically relate to variations in outcomes. For example, Monk (1992) advocates a classroom approach to data collection and analysis. Berne and Stiefel (1995) suggest an approach which focuses more on a student level of analysis. While FAM makes an important contribution to organizing educational expenditure information and improving data compatibility across jurisdictions, it needs to go one important step further in helping policymakers understand issues of equity, adequacy, and productivity in education.

Specifically, the role of the service delivery system needs to be more clearly defined in order to increase understanding of the instructional blob. Doing so will make expenditure information on other functional categories more meaningful and useful in sorting out the potential effects on student learning. In other words, information must be gathered in such a way that any potential relationship between the outcomes and inputs can be observed. Data on inputs should be organized according to the *ways in which services are delivered to students* since these service delivery systems may be more helpful in sorting out effects on student outcomes. Thus, the service delivery system becomes a principal unit of analysis. The approach

which focuses on service delivery has been referred to in the literature as the Resource Cost Model (RCM).[6]

A service delivery system is a collection or combination of resources (i.e., inputs) that is specifically organized to provide a certain service to a target population of students or clients. A service delivery system should be defined in such a way as to have a relatively common meaning and structure in terms of relevant ingredients or inputs to educational professionals.

A self-contained classroom for grades one through three is one example of a service delivery system. This delivery system is most commonly used to serve students in the general elementary education program, and consists of one full-time teacher, occasionally a part-time instructional aide, some consumable instructional supplies and materials, an allocation of books, certain specified furnishings and equipment, and a specific allocation of classroom space. The size of the delivery system is essentially determined by the class size.

A second example of a service delivery system is a pull-out program. This program might consist of language arts learning experiences for educationally disadvantaged students who have been pulled-out of the regular elementary classroom by a specially trained teacher. It may also include some specialized instructional materials designed for this particular group of children. The size of this pull-out program might be defined in terms of the specific number of children pulled out or in terms of an overall caseload for the teacher.

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[6] For a detailed discussion of the RCM, see Chambers and Parrish (1994b and 1994c).

As these examples suggest, service delivery systems represent the specific context within which the educational production process occurs (i.e., the interaction between instructional staff or other educational inputs and the students being served). Moreover, the delivery system should be defined in terms that are relatively common across local agencies. Even though the precise resource requirements that make up a particular service delivery system may differ across local agencies, the basic structure and definition of the delivery system tend to retain certain characteristics across these agencies. This level of analysis often reveals differences in resource allocation patterns that are hidden in more aggregative information. A database that focuses on the delivery system as the unit of analysis can provide the foundation for analysis of the patterns of resource utilization and for analysis of the relationship between inputs and outcomes.

Using the delivery system as the unit of analysis provides a solid foundation for conducting cost and resource-based analysis and ultimately for doing cost-effectiveness analysis. The delivery system allows the analyst to sort out the factors underlying variations in the expenditures across local jurisdictions. Expenditure variations can readily be sorted into differences in:

- salaries and benefits paid to the types of school personnel employed within the delivery systems,
- sizes of the delivery system units (e.g., class sizes, caseloads, school sizes, or numbers of students served),

- resources employed to provide a given type of delivery system (i.e., the delivery specification itself), or

- the combination of delivery systems offered to serve the particular student populations within a given local school system.

From a policy perspective, this information is important because it helps explain the patterns of variation in resource allocation across local school systems. It allows policymakers to trace the impact of their decisions on actual school services. Tracing the impact solely to dollar allocations or differences in expenditure provides little information as to the real effect on educational services.

The focus on the delivery system also ties dollars to resources and resources to students served. With this type of data system, one can ultimately tie outcomes back to subsets of students, to resources utilized, and to the dollars allocated. More importantly, it can associate the combinations of service delivery systems with certain student characteristics and outcomes. These kinds of linkages allow ongoing assessment of the adequacy and equity of service delivery and funding systems and provide a foundation for cost-effectiveness comparisons.

Implications for the Level of Analysis: the District, School, Program, or Student

The foregoing discussion has important implications for school versus district level analysis. While most services are delivered to students at the school site, the foregoing discussion really suggests that the importance of the service delivery system

as the unit of analysis transcends whether it is provided at the school or from a more centralized source. From an analytical standpoint, it is important to describe the delivery system in a way that closely reflects the way services are organized, managed, and actually delivered. To understand the factors that affect variations in the costs of services requires an accurate description of how resources are combined, allocated, and utilized to provide those services. If a given service is most appropriately managed and delivered out of the central office, then the service delivery system should be specified at the level of the district office. If it is provided most efficiently at the school site, then costs should be analyzed and modeled at the school site.

To illustrate this point, consider the provision of school transportation services. Most school districts provide home-to-school transportation services to multiple school sites. However, more often than not, the resources (bus drivers, mechanics, and the buses themselves) utilized for home-to-school transportation are used across school sites and there is some level of interdependence in the way home-to-school transportation services are provided in one school versus another based on the patterns of attendance, school boundaries, and proximity, among other variables. The result is that the marginal costs of providing transportation services to one school may be very much affected by the level of services at other schools as well as the geographic characteristics of the school in question. For this reason, it is important to analyze and model transportation services as they are delivered, which is more often than not a centralized service organized through the district office.

Similar arguments could probably be made for analysis of certain other more centralized services such as psychological services or maintenance and operations.

While marginal costs may certainly be identified, the size of the district, the types of students served in different sites, and the geographic distribution of schools are very likely to affect the efficiency with which such services are provided.

Whether analysis is conducted at the school or district level should depend on which unit is most appropriate to the specification of the service delivery system itself. Some service delivery systems are best specified at the school level, while others are best described and specified as central, district-level services.

Since service delivery systems are defined according to a target population of students, the nature of the target population of students will define the general educational program area to which a service delivery system should be assigned. Thus, aggregation to the program level from the service delivery system should be a relatively straightforward exercise.

A different level of analysis to consider for input-output analysis is the student. Here again, the service delivery system provides a useful analytical framework for organizing information. Each student is assigned to a series of service delivery systems. It is through the interaction of the student with the personnel and nonpersonnel resources that schooling outcomes are produced. By assigning the average cost of each relevant service delivery system to a student, it is possible to compare the costs of services to individual student outcomes. If outcomes relate to specific services, then these outcomes can be related to the costs of those service delivery systems. If not, then the aggregate costs of each student's unique combination of service delivery systems could be compared to the collection of individual student outcomes. This can be accomplished with appropriate coding of

information and by adopting compatible coding structures across student, personnel, and fiscal databases.

Concluding Remarks

This chapter has suggested a division among educational researchers across disciplinary boundaries which has implications for the way data are organized and analyzed. The differences in training and perspectives are most obvious among researchers who specialize in fiscal, curricular, or assessment research in education. However, even within the single strand of fiscal research in education, differences emerge between accountants and economists in disciplinary perspectives that affect the tools of measurement.

The accountant's perspective emphasizes measurement in terms of dollars and focuses attention on the traditional mechanisms for organizing fiscal data around objects of expenditure, function, and program. Objects of expenditure divide expenditures in terms of salaries, benefits, books, and instructional supplies. Function divides expenditures by purpose such as instruction, administration, and support. Program divides expenditures according to student needs such as level of disability, economic disadvantage, and language proficiency. To a large degree, the accountant's perspective is motivated by the reporting requirements of higher levels of governments that contribute substantial resources to public education. Compliance with the law and with program regulations requires tracking of expenditures and assurance that public tax dollars are being used for the purposes intended.

There has been increasing emphasis of late on getting closer to the student by measuring expenditures at the school rather than the district level. This emphasis reflects an effort to recognize the differences across schools in the level of resources made available to students in order to understand differences in outputs. In turn, this reflects an increasing frustration in the literature (e.g., see Hanushek, 1997) that continues to find no consistent, systematic relationship between outcomes and educational spending. However, even Hanushek admits that dollars can make a difference in the correct set of circumstances.

The perspective of the economist focuses on the way specific resources are combined to produce student outcomes. The economist places resource allocation within a model of human behavior based on optimization: maximizing outcomes within budget constraints or minimizing costs within the constraints imposed by the technology by which inputs produce outcomes. Thus, how one organizes and allocates resources for production is conditioned by our knowledge of technology and the relative prices of the inputs faced in the economic marketplace. That is, the economist focuses on issues of productivity and efficiency and not just on reporting. The way resources are organized and used for production are important for what they can produce, not just as a reporting mechanism. This is not so much intended as a criticism of accounting as much as a recognition of the differences in what motivates the structures of the two disciplines: the economist motivated by a desire to understand and explain patterns of behavior, while the account is primarily motivated by organizing data to understand compliance and to satisfy government reporting requirements.

This discussion does not suggest that one could or should attempt to quantify the educational process in its entirety. The very complex interactions involved do not easily lend themselves to quantitative analysis of inputs and outputs. For example, the list of outputs is extensive; many cannot be precisely measured. Policymakers would have difficulty agreeing on a list of the most appropriate educational outcome measures and even more difficulty assigning relative priorities to each. In addition, the processes by which inputs are translated into educational outcomes are not fully understood.

Given these technical difficulties, it would be foolish to attempt to rely too rigidly upon a structured cost-effectiveness framework for evaluation. Nevertheless, the cost-effectiveness framework can prove useful for decision making and can stimulate further thought among policymakers and analysts about other less quantifiable aspects of the educational process that must be considered in deciding policy. It places policy decisions within a context where tradeoffs between competing activities and the relationships between education allocation decisions and results can be examined.

By developing educational databases with these issues in mind, one can provide a common base for assessing how well the system is doing and how performance varies across the jurisdictions. Are some LEAs doing better than others? Why? What can be learned to improve the system for all children?

III. Uses of Accounting Data

Introduction

The tables presented in this chapter use data requested from the Ohio Department of Education (ODE) for the 1995–96 school year. The ODE database was selected for this study because it includes a comprehensive, school level accounting system, and according to officials in the ODE, the database design was based on the Coopers-Lybrand Financial Analysis Model (FAM). The discussion highlights some of the common ways accounting data are used to describe the utilization of school resources.

The accounting data presented in this chapter are derived from a massive file which contains detailed records of expenditure and revenue transactions for each school and central district office throughout the State of Ohio. The expenditure transactions alone account for more than 1.2 million file records covering approximately 600 school districts and more than 3,400 schools. To the extent possible, all transactions are coded at the school or district level where they occurred. That is, the salaries of personnel are coded according to the school to which they are assigned for service. It is not clear, however, the extent to which there is any consistency across the system in the way personnel who serve multiple schools are

coded[7]. Nevertheless, the coding of fiscal data to the school level is not currently practiced in very many states, and this represents an important accomplishment for the ODE system. The analysis focuses on the expenditures and ignores the sources of revenues.

The structure of the accounting system includes a comprehensive set of codes that categorize each fiscal transaction according to the object of expenditure, the function, and the job code of the individual employees. The ODE manual for the Education Management Information System (EMIS) includes an array of approximately 200 object codes, 300 function codes, and 100 job assignment codes. Within the function codes, the ODE embeds some information about the programs to which the expenditures are devoted. For example, the programs are delineated by levels (elementary, middle, and high school) and by type of child served including gifted, students with disabilities, culturally different, disadvantaged, and adult.

Unfortunately, school districts in Ohio do not consistently use all of the codes available to report information to the state. For example, valid job codes appear in only about 11 percent of the expenditure records contained in the file. In some instances, the job codes could have provided more information on specifically how resources were being utilized within functions and which kinds of personnel (e.g., teachers or administrators) were charged to which functional categories. The use of valid job codes would have permitted a more detailed analysis than is currently possible of how services were delivered to children.

[7] It should be noted that the lack of consistent coding of personnel who serve multiple schools may be a problem with both the accounting and RCM databases used in the present study.

Schools are also coded according to type or level. For the purpose of simplicity, the analysis limits schools to one of five types: three school types categorized by level including elementary, middle, or high school; and two by school types categorized by program including special needs programs (i.e., for students with disabilities and disadvantaged youth), vocational education, and other schools such as adult or continuation. Most of the analysis excludes the other schools since they account for only a very small percentage of total expenditures, and the lack of clearly defined services these schools provide to students makes it difficult to interpret the information.

Percent of Total Expenditure at the Schools Versus the Central District Office

Table III-1 shows the distribution of total expenditures by school type and the central office. According to the accounting data, approximately 54 percent of every education dollar is spent in the schools, while the remaining 46 percent is spent at the central district office. Approximately 23 percent is allocated to elementary schools, 11 percent to middle schools, and almost 19 percent to high schools. The remaining one percent is shared among special need (mostly special education), vocational, and other schools.

But how are these dollars of expenditure used? What kinds of resources are purchased and what do they tell us about resource allocation in schools? The data in table III-1 suggest that a substantial proportion of school district spending ends up in the central office. This is a very contentious, hot-button issue since central office

expenditures sometimes seem to be equated with administrative expenditures. Does the high percentage of dollars spent in the central district office indicate that a large percentage of the budget was used for administrative services? Moreover, how are funds at these different levels of expenditure (i.e., school versus district office) used and how do they vary across types of schools? Table III-2 presented in the next section provides some data to help address these questions.

Table III-1. Percent of Total Expenditures Allocated to the Schools Versus the Central District Office

Building Type	Total Expenditures (in Dollars)	Percent of Total Expenditure
School Type		
Elementary school	2,732,861,849	23.04
Middle school	1,306,482,536	11.02
High school	2,207,108,176	18.61
Special needs school	21,743,647	0.18
Vocational school	43,552,597	0.37
Other schools	53,740,593	0.45
Central District Office	5,494,468,590	46.33
TOTAL	**$11,859,957,988**	**100.00%**

Variations in Expenditures per Pupil across Schools by Level and Type

Table III-2 examines the overall patterns of expenditures across types of schools and the central office along with the uses of those funds. The table show the expenditures on the average student attending Ohio schools by school type and the

central office, broken down by function. Highlights of the information contained in the functional breakdowns are presented below.

Differences in Expenditure by School Level

Table III-2 shows that per pupil expenditures are greater in schools at higher grade levels. For example, the average total per pupil expenditure for elementary students amounts to $3,308, while at the middle and high schools, per pupil expenditures are $3,923 ($615 more than elementary schools) and $4,256 ($948 more than elementary schools), respectively. That is, middle schools in Ohio spent about $615 or 18.6 percent more than elementary schools, and high schools spent $948 or 28.7 percent more than elementary schools. What factors underlie these patterns of variation across types of schools?

Table III-2. Weighted Mean Value of Expenditures per Pupil and Percent Allocation by Function and by Type of School for Public Schools in Ohio, 1995–96

By Function	Elementary School		Middle School		High School		Special needs School		Vocational School		Central Office	
	$/pupil	%	$/pupil	%	$/pupil	%	$/pupil	%	$/pupil	%	$/pupil	%
Instruction												
Regular Instruction	2,039	61.6	2,280	58.1	2,100	49.3	833	7.8	1,823	13.5	399	13.3
Special Instruction	404	12.2	362	9.2	216	5.1	6,137	57.6	386	2.8	174	5.8
Vocational Education	1	0.0	58	1.5	321	7.5	251	2.4	4,745	35.0	26	0.9
Adult Education	0	0.0	0	0.0	3	0.1	40	0.4	1,360	10.0	11	0.4
Other Instruction	1	0.0	1	0.0	4	0.1	1	0.0	2	0.0	36	1.2
Administration and Supporting Services												
Support Services (e.g., counseling & library)	203	6.1	271	6.9	325	7.6	1,780	16.7	2,081	15.4	225	7.5
Administrative Services	236	7.1	287	7.3	297	7.0	886	8.3	1,014	7.5	359	11.9
Operations (e.g., maintenance & transportation)	279	8.4	340	8.7	397	9.3	577	5.4	1,285	9.5	658	21.9
Operation of Noninstructional Services	69	2.1	98	2.5	97	2.3	101	0.9	296	2.2	167	5.6
Extracurricular Activities	13	0.4	88	2.2	291	6.8	7	0.1	94	0.7	45	1.5
Capital Expenditures	62	1.9	134	3.4	200	4.7	37	0.3	452	3.3	666	22.1
Other Uses of Funds	1	0.0	4	0.1	5	0.1	0	0.0	11	0.1	243	8.1
TOTAL	**$3,308**	**100.0%**	**$3,923**	**100.0%**	**$4,256**	**100.0%**	**$10,650**	**100.0%**	**$13,549**	**100.0%**	**$3,009**	**100.0%**

The data in this table are presented as they are recorded in the Ohio accounting database.
School enrollment is used as the weight for calculating the mean per pupil expenditures in this table: that is, these data are pupil-weighted. A large school is weighted proportionately more heavily than a small school the calculation of these mean values. These data represent the expenditure devoted to the average pupil (by school level or type) served in the State of Ohio. If these data were not weighted, they would reflect the expenditure per pupil in the average school (by level or type). Pupil weighted data treats all students equally, while school weighted data treats all schools equally.

These overall patterns of variation in expenditures by school level are only partially accounted for by differences in the expenditures on instructional services.

Elementary schools spend $2,445 on instruction, while middle schools spend $2,701 or 10.4 percent more than elementary schools and high schools spend $2,644 or 8.1 percent more than elementary schools.[8] These data indicate that $256 (= $2,701 - $2,445) or 41.6 percent (= 256/615) of the overall difference in expenditures between elementary and middle schools can be accounted for by instruction, while $199 (= $2,644 - $2,445) of the difference between elementary and high schools can be accounted for by instruction. Most of the difference between elementary and middles schools is reflected in expenditures for regular instruction which are $2,039 for elementary and $2,280 for middle schools. However, there is less of a difference between high schools and elementary schools with respect to regular instruction (i.e., $2,039 versus $2,100).

Another way of viewing these data is in terms of the relative contributions of each component of expenditure. That is, the school attended by the average elementary school student spends 73.9 percent of its budget on instructional services, while the middle and high schools spend proportionately less at 68.8 percent and 62.2 percent, respectively. Schools at lower grade levels spend proportionately more on instruction.

There are substantial differences among school levels related to special instruction (expenditures for serving special needs populations such as students with disabilities or students eligible for compensatory education programs or programs for limited English proficient students). Elementary schools spend on average $404 (or 12.2 percent of their budget) on special instruction relative to $362 for middle schools

[8] These figures are the sums of the per pupil expenditures under the subheading of instruction in table III-2.

(or 9.2 percent of their budget) and $216 for high schools (or 5.1 percent of their budget). This more than likely reflects the greater prevalence and intensity of services for students with disabilities in elementary schools relative to schools at higher levels.

On the other side of the coin, vocational instruction is much more prevalent in high schools accounting for $321 per pupil in expenditure (or 7.5 percent of the budget) relative to only $58 in middle schools (or 1.5 percent of the budget), and $1 per pupil (or less than 5/100ths of one percent) in elementary schools.

Support services (e.g., counseling and library services) account for another $122 of the difference in per pupil expenditures between high schools and elementary schools ($325 versus $203), and operations and maintenance account for about $118 of the difference in per pupil expenditures ($397 versus $279). Administration accounts for $61 per pupil of the difference ($297 versus $236) and delivery of noninstructional services accounts for another $28 per pupil of the difference in per pupil expenditures ($97 versus $69) between high schools and elementary schools. High schools spend proportionately more on support services and operations than elementary schools. High schools spend 7.6 percent of their budgets on support versus 6.1 percent for elementary schools, and they spend 9.3 percent for operations versus 8.4 percent for elementary schools. The proportion of expenditures on administration is about equal for high schools and elementary schools (7.0 percent and 7.1 percent, respectively).

However, schools at the upper grade levels tend to spend both absolutely and relatively more than elementary schools on virtually all kinds of noninstructional services. The greatest portion of the difference can be accounted for by extra

curricular activities for which high schools spend $278 more than elementary schools ($291 versus $13 per pupil). Extracurricular activities represent almost 6.8 percent of a high school's budget while only about 0.4 percent of elementary school budgets is spent on these activities.

Capital expenditures account for another $138 of the difference ($200 per pupil for high schools versus $62 for elementary schools), but it is not entirely clear from these data that all of the capital expenditures are truly allocated appropriately to the schools (see discussion below).

Differences in Expenditure by School Type

Table III-2 also shows that per pupil expenditures are greater for schools with specialized missions (i.e., special needs schools and vocational schools) than for regular schools. For example, special needs schools spend about 3.2 times as much as elementary schools ($10,650 versus $3,308), and vocational schools spend 4.1 times as much as elementary schools ($13,549 versus $3,308) and about 3.2 times as much as high schools ($13,549 versus $4,256).

Instructional expenditures per pupil for special needs schools amount to almost three times those of elementary schools ($7,262 versus $2,445) and noninstructional expenditures are almost four times as much for special needs as elementary schools ($3,388 versus $863). This is consistent with the notion that special needs populations (mostly special education students) require many related services (e.g., therapeutic, psychological, and counseling) that are not required for regular elementary students. Instructional expenditures for vocational schools are more than 3.1 times those of

regular high schools, and non-instructional expenditures amount to a little over 3.2 times those of regular high schools. Proportionately, special schools spend about 68 percent of their budgets on instruction, while vocational schools spend about 61 percent. A very large percentage of instructional expenditures in special needs schools is for "special instruction" (84.5 percent = 100 × 6,137/7,262), while a large percentage of instructional expenditures in vocational schools is for vocational education (57.1 percent = 100 × 4,745/8,316). Regular instruction accounts for a relatively greater percentage of vocational school budgets than special needs school budgets (13.5 percent versus 7.8 percent).

Administrative expenditures are both absolutely and relatively higher in the special needs and vocational schools than in regular schools. For example, special needs schools spend $886 per pupil (8.3 percent of the budget) relative to $236 (7.1 percent of the budget) in elementary schools. Vocational schools spend over $1,000 per pupil for administrative services (7.5 percent of the budget) relative to $297 per pupil (or 7.0 percent of the budget) in high schools. Support services also tend to be associated with substantially higher expenditures. Special needs schools spend $1,780 (16.7 percent of total expenditures) versus $203 (6.1 percent of the budget) in elementary schools. Vocational schools spend $2,081 (15.4 percent of total expenditures) versus $325 (7.6 percent of total spending) in high schools. Operations in special schools and vocational schools tend to be absolutely more, but represent similar proportionate amounts of the budgets relative to regular schools.

The Use of Central Office Expenditures

Central Office Administration

Central office expenditures amount to $3,009 per pupil across all pupils in the districts. Of these expenditures at the central office level, approximately 11.9 percent is allocated to administrative services ($359 per pupil). Combining this figure with the figure in table III-1, these data suggest that about 5.5 percent (= 11.9 percent of 46.3 percent) of total expenditures is allocated to central office administrative expenditures. Combining the percentages in table III-1 with the percent of the expenditures allocated to administration for each school type, one can estimate that the overall percentage of total expenditures allocated to school and central office administrative expenditures combined amounts to 9.4 percent.[9] That is, less than one dollar in ten is allocated to all activities that the ODE accounting system defines as administration.

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[9] This figure is obtained by multiplying the percent of total expenditures allocated to each school type by the percent of the expenditures for each school type allocated to school administration. (For this purpose, it was necessary to include the percentage of other school budgets allocated to school administration which was 15.1 percent.) Overall expenditures allocated to school administration are equal to the following:

% of total expend. allocated to school administrators
= .071×.230 + .073×.110 + .070×.186 + .083×002 + .075×.004 + .151×.005
= .039

Overall percentage is determined by the following sum: .039 + .119×.463 = .094

Central Office Operations and Capital Expenditures

Approximately 21.9 percent (or $658 per pupil) is allocated to operational services such as maintenance and operations or transportation services, and it is certainly likely that a substantial portion of both of these types of expenditures is generated by the needs of the individual schools. Another 22.1 percent (or $666 per pupil) is allocated to capital expenditures which are to a substantial degree generated at the school level.

Central Office Nonadministrative Expenditures

Central office expenditures also appear to account for many other functions which would appear to be generated by the needs of students being served at the schools. These expenditures include instructional services which account for 21.6 percent (=13.3 percent + 5.8 percent + 0.9 percent + 0.4 percent + 1.2 percent) or $646 per pupil; pupil and staff support services (guidance, psychological, personnel services) which account for 7.5 percent or $225 per pupil; and extracurricular activities which account for 1.5 percent or $45 per pupil. That is, overall about 30.6 percent of central office expenditures (or $916 per pupil) is generated by specific instructional or support needs of staff or students in the schools.

What Differences in Expenditure by Object of Expenditure May Tell Us

To some degree, the variations in functional allocations of expenditures across school levels and types presented in table III-2 reflect real differences in the needs of

each type of school. However, these differences may also reflect, to some degree, differences in the mechanisms used by districts to allocate expenditures to schools versus the central office. Without further explorations into accounting practices at the local level, there is no way to be sure about the extent of the impact of these different accounting practices. However, table III-3 which displays expenditures broken down by object of expenditure, provides some clues.

Specifically, total expenditures presented at the bottom of table III-2 are broken down according to certified salaries and benefits, non-certified salaries and benefits, benefits that could not be assigned to certified or noncertified personnel, nonpersonnel resources, and invalid object codes. The invalid object codes simply reflect the fact that some small percentage (in general, far less than 0.1 percent of total expenditures) of the data reported by the ODE were assigned invalid codes for the object of expenditure. These could easily be accounted for by data entry errors.

Benefits that were unassigned in the existing accounting information did not permit the assignment of the dollar amounts to certified or noncertified employees. For four of the five types of schools presented in table III-3, these unassigned benefits accounted for less than one-half of one percent of total expenditures. For vocational schools and for central offices, these unassigned benefits amounted to about one percent of expenditures.

Table III-3. Weighted Mean Value of Expenditures per Pupil and Percent Allocation by Object of Expenditure and by Type of School for Public Schools in Ohio, 1995-96

By Object	Elementary School		Middle School		High School		Special Needs School		Vocational School		Central Office	
	$/pupil	%	$/pupil	%	$/pupil	%	$/pupil	%	$/pupil	%	$/pupil	%
Certified salaries	2,140	64.7	2,489	63.4	2,499	58.7	6,367	59.8	7,595	56.1	333	11.1
Noncertified salaries	289	8.7	304	7.7	341	8.0	1,664	15.6	1,296	9.6	336	11.2
Certified benefits	419	12.7	487	12.4	488	11.5	1,414	13.3	2,099	15.5	455	15.1
Noncertified benefits	74	2.2	76	1.9	81	1.9	412	3.9	348	2.6	211	7.0
Unassigned benefits	14	0.4	11	0.3	11	0.3	21	0.2	149	1.1	30	1.0
Nonpersonnel resources	371	11.2	556	14.2	834	19.6	772	7.2	2,062	15.2	1,642	54.6
Invalid object codes	1	0.0	0	0.0	2	0.0	0	0.0	0	0.0	2	0.1
TOTAL	**$3,308**	**100.0%**	**$3,923**	**100.0%**	**$4,256**	**100.0%**	**$10,650**	**100.0%**	**$13,549**	**100.0%**	**$3,009**	**100.0%**

The data in this table are presented as they are recorded in the Ohio accounting database.
School enrollment is used as the weight for calculating the mean per pupil expenditures in this table: that is, these data are pupil-weighted. A large school is weighted proportionately more heavily than a small school the calculation of these mean values. These data represent the expenditure devoted to the average pupil (by school level or type) served in the State of Ohio. If these data were not weighted, they would reflect the expenditure per pupil in the average school (by level or type). Pupil weighted data treats all students equally, while school weighted data treats all schools equally.

Employee Benefit Rates

Perhaps the most interesting information revealed in the object of expenditure data is based on the analysis of benefit rates. Benefit rates for school personnel typically range from about 20 to 40 percent of salaries.[10] Taking the ratio of certified benefits to certified salaries by school type, certified benefit rates range from a low of

[10] For a discussion of some typical benefit rates, see the section on the estimation of budget shares or weights in Chambers (1997b).

just below 20 percent for regular elementary, middle, and high schools to a high of about 28 percent in vocational schools. Taking the ratio of noncertified benefits to noncertified salaries by school type, noncertified benefit rates range from 24 to 27 percent across the school types. However, the benefit rates estimated for central office staff are 137 percent for certified personnel and 63 percent for noncertified personnel. These numbers appear to be too high to reflect true benefit rates. What it suggests is that at least some of the districts actually report some portion of the benefits for school personnel at the central office rather than at the school sites where they are employed. If these funds were reallocated across the schools, the overall benefit rates estimated at the district level would be 27.3 percent for certified and 34.4 percent for noncertified personnel.[11] The bottom line is that it is likely that not all of the compensation costs (i.e., benefits) of employees follow the employees to the programs or services they provide.

Percent of Total Expenditures Allocated to Special Needs Programs

Accounting data of the type maintained in Ohio should be able to provide information on allocation of school budgets to programs serving specific categories of students (e.g., students with special needs or with disabilities). This section explores the potential for the ODE system to provide such estimates.

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[11] Benefit rates for noncertified personnel tend to be higher than those for certified personnel because noncertified personnel tend to have lower average salaries with approximately the same lump sum (per employee) benefits for health insurance. For example, if the district contributes $5,000 per employee for health insurance, this contribution reflects a higher percentage of the smaller average salary typical of noncertified versus certified employees.

One of the major policy concerns in recent years has been the perceived encroachment of special education services on regular programs in the context of limited educational resources. Table III-4 displays information on the allocation of instructional dollars to regular versus other educational programs. It shows that about 77 percent (i.e., about $4.3 billion) of the more than $5.5 billion instructional dollars spent in Ohio is allocated to regular instruction. The remaining 23 percent (i.e., $1.2 billion) is allocated to special instruction (16 percent), vocational instruction (almost 5 percent), adult education (less than half of one percent), and other instruction (about 1 percent).

According to these figures, a little over 10.34 percent (i.e., $571.2 million which includes $564.5 million for special instruction and $6.7 million for vocational education) of total expenditures for instruction is specifically allocated to services for students with disabilities (i.e., special education). Students with disabilities account for 12.37 percent of the student population. However, it is important to recognize that these expenditures represent the incremental expenditures (i.e., marginal costs, if you will) for services designed for students with disabilities since some expenditures on these special needs students would also be captured under regular instruction to the extent that these students receive services within the regular education environment.[12]

[12] If one assumes that students with disabilities receive approximately 12.37 percent of the remaining 89.66 percent (= 100.00 - 10.34) of non special education expenditures, then students with disabilities account for about 21.43 percent (= 11.09 + 10.34) of total expenditures: 11.09 percent from regular instruction devoted to students with disabilities and the 10.34 percent of total expenditures devoted to services designed specifically for students with disabilities.

Table III-4. Percent of Total Expenditures Allocated to Various Programs and Student Populations

Program	Total Instructional Expenditure (in Dollars)	Percent of Instructional Expenditure
Regular Instruction	$4,266,739,416.00	77.28%
Special Instruction		
Academically gifted	38,636,139.00	0.70
Special education	564,468,292.00	10.22
Culturally different	10,109,134.00	0.18
Disadvantaged youth	224,997,049.00	4.08
Other special needs	63,306,628.00	1.15
Vocational Education		
Unspecified	588,983.00	0.01
Regular	246,899,670.00	4.47
Special education	6,667,501.00	0.12
Adult Education	26,452,501.00	0.48
Other Education	71,550,444.00	1.30
TOTAL	**$5,520,797,919**	**100.00%**

These data provide no explicit information on how much of the expenditures on regular education are attributable to students with disabilities. In addition, because of the way the accounting data are organized, there is no consistent or specific way to ascertain how much of the program administration and support services are associated with serving students with disabilities. That is, how much is spent on direction and coordination of program activities, and how much is spent on assessment, evaluation,

identification, and related services (e.g., therapy, counseling) for students with disabilities? Central administration and support expenditures are not delineated very precisely by program or types of students served. If these expenditures had been charged to a separate fund, as Title I expenditures might have been, then there may have been some chance of identifying them separately. But special education expenditures are not charged to a separate fund and, in this instance, blend in with regular administrative and support expenditures.[13]

Comparing Expenditures per Total Pupil Counts Versus per Pupils Served

So far, the analysis has focused either on percentage allocations of total expenditures or expenditures per total enrollment. It is important in doing cost analysis to relate expenditures to the populations actually being served. Because the accounting system is not explicitly linked to counts of students, some effort is required to associate dollars of expenditure with the populations served.

Table III-5 develops some of those linkages for certain categories of students in each of the types of schools and school districts in order to show the differences in expenditures per total enrollment and expenditures per pupil served. Part A of table III-5 displays expenditures per total enrollment, while Part B shows expenditures per pupil served.

[13] For a further discussion of this issue, the reader is referred to Chambers (1998).

Table III-5. A Comparison of Instructional Expenditures per Total Enrollment Versus per Pupil Served by Program and by Type of School for Public Schools in Ohio, 1995–96

Program	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central Office
Part A. Expenditures per Total Enrollment						
Regular Instruction	$2,039	$2,280	$2,100	$833	$1,823	$399
Special Instruction*						
Academically gifted	15	17	4	0	0	10
Students with disabilities	215	269	184	5,463	159	105
Disadvantaged youth	137	41	11	136	31	49
Vocational Education						
Regular	1	57	316	251	4,664	25
Part B. Expenditures per Pupil Served						
Special Instruction						
Academically gifted	125	114	29	0	0	10
Students with disabilities	1,628	2,257	2,173	11,742	1,205	105
Disadvantaged youth	1,038	32	5	0	25	49

*These categories of special instruction represent only a subset and therefore the totals will not sum to those presented in table III-2.

Regular instruction displayed in Part A of the table shows expenditures per total enrollment of $2,039 for elementary schools. But this figure is probably close to being an expenditure per pupil served since most students within the elementary school spend some portion, if not all, of their time receiving regular education services. This is similarly true for students in the middle and high schools. The only students within the regular schools who are, for all intents and purposes, not served by the regular

program are those students with disabilities who are served almost entirely in segregated classrooms within these regular schools.

In many instances, vocational schools provide a combination of regular instruction and specialized classes in vocational subjects. Thus, students in vocational schools spend some portion of their time receiving regular instructional services and some portion receiving vocational services. Thus, the expenditures on regular instruction and those on regular vocational instruction may well reflect numbers which are fairly close to the relative expenditures per pupil for these components of the instructional program.

Nevertheless, comparisons of some of the figures in Part A and Part B of table III-5 illustrate the importance of linking student counts with expenditures. In the lower portion of the table, the counts of students who are gifted, have disabilities, or are disadvantaged in each school and central office are matched to the expenditure figures. The impact is dramatic for all three categories of students. In elementary schools, expenditures on instructional services for academically gifted students are in fact $125 per pupil as opposed to $15. For students with disabilities, per pupil instructional expenditures amount to $1,628 as opposed $215. For students classified as disadvantaged youth, the instructional expenditures per pupil amount to over $1,000 rather than the $137.

In the middle and high schools, expenditures per pupil for students with disabilities rise to a level comparable to per pupil expenditures on regular instruction (i.e., $2,257 in the middle, and $2,173 in the high school) when actual counts of these students are linked to program expenditures.

If one assumes that students with disabilities generate a need for the same level of regular education services as all other students, then the total costs of serving students with disabilities would be measured by the sum of regular education expenditures and special instruction expenditures for students with disabilities: that is, $3,667 for elementary, $4,537 for middle, and $4,273 for high schools. Since students with disabilities probably do not receive the same exposure to regular instructional resources as other students, these estimates perhaps overestimate the instructional expenditures for regular education somewhat. However, the vast majority of special education students are likely to generate the need for a level of regular instruction resources that is comparable to that for regular students and simply receive some additional services through the special instruction programs specifically designed for them. [14]

The importance of these differences arises when considering the potential for using these resource measures for understanding differences in student performance across local jurisdictions. At the very least, measuring the impact of resources on student outcomes will require matching the measured resources to the students receiving them.

Summary

This chapter draws on the substantial fiscal database provided by ODE to develop some common measures of resources based on accounting information. This

[14] See Chaikind et al. (1993) for estimates of the regular expenditures devoted to the average student with disabilities.

chapter examines the allocation of spending between schools and the district office, across schools by level and type, by the purposes to which the funds are expended (i.e., function), by the broad categories of resources purchased (i.e., object of expenditure), and by type of program. These data provide broad based information on the patterns of the allocation and utilization of resources. These data are critical for determining where the money goes and how it is used. It is easily understood by policy and lay audiences and conveys important information about the relative importance of education compared to other public enterprises and about the relative importance of various activities within the educational domain.

The data show that almost half (about 46 percent) of all spending is carried out at the district level. The remainder is allocated to the schools. About one-fourth of the total funds are used for elementary school programs and about 30 percent is allocated to middle/junior high or high school programs. Only about one percent of the total is allocated and expended in schools designed to serve students with special educational or related needs.

The functional breakdown of expenditures reveals that far and away the majority of expenditures at any level are allocated to instructional services. Administrative services within any given school type amounted to less than 10 percent of total spending at that level. In order to compare spending across school types, per pupil figures were calculated and displayed, and these figures reveal that per pupil spending in Ohio is higher for students at higher grade levels. For example, high school per pupil spending is almost 30 percent higher than per pupil spending in elementary schools. Moreover, spending in special schools are more than three times higher than spending in regular schools.

The analysis by object of expenditure indicated some problems with respect to the allocation of personnel benefits. These data suggested that some of the personnel benefits appeared to be spent at the district level rather than following the employees to their place of employment. That is, benefits of some of the personnel who were employed at the school sites were attributed to spending at the central office. This provides a distorted view of expenditures and costs since the total costs of personnel services are not allocated to the purposes for which they are actually used.

These accounting data were useful for sorting out instructional spending at the program level (e.g., regular versus special education). However, it was discovered that it was difficult to determine how much was being spent at the central office for program administrative expenditures by program.

Finally, much of the per pupil expenditure figures show in the remainder of this chapter include total enrollment of students in a given school type. While this provides an overall picture of per pupil expenditures by school, it does not link students to the costs of services. This is especially important in dealing with costs of special needs programs in which some subset of students receive only a subset of services directed to their specific needs. If the accounting data can be organized into broad programmatic areas and these areas can be associated with the actual counts of students served, then expenditures can be presented in dollars per pupil served rather than dollars per total enrollment. This linkage is important if one is to assess the relationships between resources and student outcomes.

IV. Measuring Personnel Resources: Building Blocks of the Resource Cost Model

Introduction

This chapter takes the first step in introducing some of the concepts that underlie the RCM approach and that represent the basic building blocks of an RCM database. This process begins with building a personnel database because personnel represent the predominant resource in a social service enterprise like education and personnel can be readily measured in terms of some measurable physical quantities. Subsequent chapters describe ways of using the measures of personnel resources to understand patterns of variation in spending and to illustrate ways of organizing information to link resources to students.

The RCM approach primarily relies on a combination of staff and aggregated student information files from the ODE database to create a more detailed look at how students are served. The staff file includes 250,000 records containing detailed information about individual certified and noncertified school staff. The file includes information on work time expressed in full-time equivalents (FTEs) and/or hours of work, the level of pay expressed as an annual amount or an hourly rate of pay, and the position and assignment code of the individual. The personnel coding system includes more than 100 position codes and approximately 150 assignment area codes. The position codes designate the type of job (e.g., classroom teacher, principal), while

the assignment codes indicate the program or type of students served in that job (e.g., general education, limited-English proficient, Title I, students with disabilities).

In addition, these staffing data indicate the school to which each individual staff member is assigned. However, as with the accounting data, it is unclear how consistently staff who are assigned to multiple schools are coded in the data. That is, there is no way to determine the extent to which staff who may work in multiple school buildings are coded within each school or simply coded to the central office.

Close examination of the accounting and personnel data reveal significant information about how personnel costs are recorded in the accounting system. As reported in the discussion of the accounting data in the previous chapter, some portion of personnel benefits appears to be reported at the district level regardless of whether the individual is assigned to work at the school. Some portion of benefit expenditures do not follow the individual employee. The problem with this approach is that some portion of the full expenditures or costs of serving particular types of students in specific schools is not assigned to those students or locations. Thus, differences in the patterns of resource allocation among programs or types of students across schools will not be fully reflected in the accounting data tracked to the school.

Unfortunately, the personnel data maintained by the State of Ohio actually track only the salaries of school personnel. No data on benefits are currently tracked to individual employees. Therefore, for the tables presented in this report, benefit rates are estimated based on aggregated district level data on certified versus noncertified employees and are then assigned to each category of employee within the district. Because some portion of benefit payments made by the district is on a per employee

basis rather than a percentage of salary, assignment of benefits estimated as a fixed rate across all categories of certified and noncertified staff tends to underestimate the benefit amounts paid on behalf of employees with lower rates of pay. Thus, a school which employs teachers with lower salaries (e.g., because of lower levels of experience or education levels) will, on average, exhibit lower benefit payments than may actually be the case relative to a school which employs teachers with higher salaries (e.g., due to higher levels of experience or education levels).

Specification of a full RCM approach should encompass both personnel and nonpersonnel data (e.g., see Chambers and Parrish, 1982a or Chambers 1994a). To the extent possible, resources should be specified in terms of raw ingredients. For example, this would include FTE counts of staff (as is found in personnel data) or numbers of computers. In cases where the physical items are not of particular consequence from a productivity standpoint or data on physical counts are simply not available, then dollar figures may have to be substituted to reflect the use of these resources. However, in this case, there are no physical counts of other raw inputs used by school districts, and the fiscal data are coded in a way that is not fully compatible with the personnel data. For this reason, the following discussion of the RCM approach only focuses on the personnel data derived from the ODE.

The tables in this chapter illustrate the kinds of information that are best ascertained from data on individual staff as reflected in the ODE files. Staff data are primarily organized by what the ODE refers to as position and assignment codes. Position in this instance is similar to what may be commonly referred to as a job title. Assignments tend to be associated with the types of students served as used by the ODE coding system. Data are first displayed in terms of total personnel expenditures

per pupil, and then are displayed in terms of the physical quantities of personnel measured in FTEs and quantities of stipends.

Personnel Expenditure by Position

Table IV-1 displays data on personnel expenditures per pupil (in total enrollment) by position for each school type (i.e., elementary, middle, high, special needs, vocational) and for the central district office. Per pupil figures at the school level are based only on pupils enrolled in the designated type of school, while the per pupil figures for the central office are based on total pupils enrolled in the district. All data are weighted according to school and district size so that all figures reflect the access of the average student to personnel resources. Table IV-1 lists approximately 60 different categories of staff positions.

Table IV-1. Personnel by Position: Weighted Mean Value of Actual Personnel Expenditures per Pupil by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year

Position Descriptions	Weighted Mean of Actual Personnel Expenditures per Pupil [a]					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Instructional Services						
Regular teaching assignment	$1,979	$2,133	$2,030	$1,154	$1,569	$36
Special education teaching assignment	281	333	206	4,662	226	15
Vocational education teaching assignment	1	70	341	452	3,813	3
Educational services teacher	174	165	39	25	0	43
SE supplemental services teacher	1	1	1	0	0	1
Remedial specialist	79	39	13	27	100	4
Tutor/small group instructor	42	40	27	119	41	18
Adult education teacher	0	0	1	38	0	4
Teaching aide assignment	102	54	47	918	241	10
Other Education Support Services						
Professional — educational	0	0	0	0	0	0
Curriculum specialist	3	1	2	0	143	5
Counseling assignment	26	125	160	53	186	12
Librarian/media	20	58	63	0	67	6
Audio-visual	0	1	6	0	23	1
Other vocational personnel	0	1	10	0	306	1
Other professional — educational	5	13	17	26	567	14
Related Services						
Psychologist	3	3	4	135	961	20
Physical therapist	1	0	0	273	0	1
Speech and language therapist	20	5	2	232	2	21
Occupational therapist	1	0	0	351	0	1
Mobility therapist	0	0	0	27	0	0
Educational interpreter	1	1	1	0	0	0

continued

Table IV-1. Personnel by Position: Weighted Mean Value of Actual Personnel Expenditure per Pupil by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean of Actual Personnel Expenditures per Pupil [a]					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Other Professional Support						
Physician	0	0	0	0	48	0
Nursing assignment	6	8	7	53	25	15
Dental assignment	0	0	0	0	0	0
Social work assignment	1	0	1	0	29	1
Other professional assignment	4	3	3	114	41	11
Technical Assignment						
Other library media	25	14	13	30	11	1
Other technical	1	1	4	36	0	9
Extracurricular/Intracurricular Activities						
Advisor	1	6	15	1	2	1
Coaching assignment	2	21	46	1	0	3
Athletic trainer	0	0	1	0	0	0
Other extra/intracurricular activities	2	4	9	1	7	1
Administrative & General [b]						
Assistant deputy/ associate superintendent assignment	0	0	0	0	21	10
Assistant principal assignment	12	75	99	116	94	1
Foreman assignment	0	1	1	0	0	3
Ombudsman assignment	0	0	0	0	0	0
Principal assignment	153	121	93	450	325	6
Superintendent assignment[b]	0	0	1	0	0	29
Supervising/managing/directing assignment	2	4	22	371	184	53
Treasurer assignment	0	0	1	0	0	20

continued

Table IV-1. Personnel by Position: Weighted Mean Value of Actual Personnel Expenditure per Pupil by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean of Actual Personnel Expenditures per Pupil [a]					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Coordinator	2	3	18	607	142	15
Education administrative specialist	0	0	1	0	0	5
Other official/administrative	2	4	9	0	28	11
Maintenance						
General maintenance assignment	2	4	9	0	23	21
Other crafts and trade	0	0	2	0	0	31
Operative						
Vehicle operating assignment (other than buses)	0	0	1	0	0	3
Vehicle operating assignment (buses)	5	1	5	0	7	110
Equipment operating assignment	0	0	0	0	0	1
Other operative	0	0	0	0	0	3
Service Work/Laborer						
Attendance officer assignment	0	1	1	0	0	1
Custodian assignment	168	182	186	393	409	17
Food service assignment	79	107	98	137	196	13
Grounds keeping assignment	0	1	1	0	0	3
Attendant	4	3	2	59	0	2
Other service worker/laborer	10	7	6	11	94	3
Other service worker laborer	15	19	20	221	57	10
TOTAL	**$3,317**	**$3,727**	**$3,772**	**$11,536**	**$10,624**	**$709**

a. Cells with zeroes ($0) indicate that the per pupil amount is either zero or less than $0.50. In cases, where $0 are in all cells within a row, it indicates that in at least one of the cells these zero dollar values represent a value which is greater than 0 and less than 0.50.

b. In some very small school districts, certain administrative staff (e.g., the superintendent) may be assigned to, and operating out of, a school site. If the district office is located at the school site, then these administrative expenditures for district administrative staff will be assigned to the school.

Some of the highlights of the data presented in table IV-1 appear below. Before proceeding with the discussion, however, it is worth pointing out that the totals at the bottom of table IV-1 do not correspond to the totals at the bottom of table III-2 in the previous chapter. One might expect that if the estimated nonpersonnel expenditures displayed in table III-3 were added to the total personnel figures in table IV-1, the totals would equal the totals in table III-2. Unfortunately this is not the case. There are a number of reasons for the lack of correspondence between these two totals.

First, the accounting data and personnel data represent different kinds of information. The accounting data reflect a full year of actual expenditures for the Ohio school systems. The personnel data, on the other hand, represent the combination of two snapshots of staff during the course of the year. These data are collected once in the fall and once in the spring, and therefore, represent counts of staff at two points in time. These data are then used to estimate personnel expenditures. That is, the accounting data represent an accumulation of total expenditures, while the personnel data represent estimates of the total accumulation based on two points in time.

Second, there is no link between the personnel files and the fiscal files provided by the ODE. These two data systems are created somewhat independently of one another. It is not even clear from the information obtained from ODE about these two data systems, that the rules for assigning or coding individuals to particular schools are the same. Thus, it is possible that some individuals who may appear to be assigned to one school or the central office in one database could easily be coded in a different location in the other database.

Third, the personnel data system appears to include not only employees of the Ohio public schools, but also contracted personnel. These contracted personnel would tend to show up under nonpersonnel expenditures in the fiscal database, but would be identified under personnel in the staffing database used to create the data in table IV-1 and the remaining tables in this report. Contracted personnel may well be coded to the central office in the accounting system, while in the personnel or staffing database they may be coded in the schools where they are assigned.

Fourth, in the personnel database, benefit costs are estimated for school personnel and follow them to each of their assignments in which salaries are paid. There is some evidence presented in the previous chapter that not all benefit costs follow personnel to their school assignments and are coded at the district office. The result is that the accounting database appears to reveal an allocation for personnel costs at the central office that is larger than it would be if benefits were appropriately allocated to the staff who generated the costs.

There is one further note which is useful before proceeding. That is, the tables in this chapter and in Chapter V continue to use global pupil counts for calculation of per pupil expenditures. While this can be misleading when talking about programmatic costs (e.g., regular versus special education), the purpose of the analysis described in this and next chapters is focused on illustrating ways in which the personnel data begin to provide some different views of resource allocation and measurement than have been obtained from the accounting data. Following these two chapters, Chapter VII then introduces the ways in which personnel data may be linked to students served so that more accurate and informative expenditures per pupil can be presented.

Regular Teaching Assignments

Well over half of the personnel dollars expended in elementary, middle, and high schools are spent on *regular teaching assignments*: $1,979 per pupil (60 percent of the total) for elementary, $2,133 per pupil (57 percent of the total) for middle schools, and $2,030 per pupil (54 percent of the total) for high schools. Special needs schools, which for the most part serve students with severe disabilities, make the largest allocation to *special education teaching assignments* amounting to $4,662 per pupil (40 percent of the total), and the second largest allocation to *regular teaching assignments* amounting to $1,154 per pupil (10 percent of the total). Vocational schools make the largest allocation to *vocational education teaching assignments* ($3,813 per pupil or 36 percent of the total) and the second largest allocation to *regular teaching assignments* ($1,569 per pupil or 15 percent of the total).

Special Education Teaching Assignments

About $281 (8 percent) and $333 (9 percent) of total personnel expenditures per pupil are expended on *special education teaching assignments* in elementary and middle schools respectively, while only about $206 (5 percent) of total personnel expenditures per pupil are expended on *special education teaching assignments* in high schools.

Teacher Aide Assignments

Table IV-1 also shows that *teaching aide assignments* account for a larger percentage of spending in elementary schools (3 percent = 100 × $102/$3,317) than middle or high schools, both of which allocate about 1 percent to aides. Special needs schools spend almost 8 percent (= 100 × $918/$11,536) of their budgets on staff having *teaching aide assignments.*

Other Education Support Services

Relatively small amounts of funds (a total of $54 per pupil or less than 2 percent total) are spent on other education support services in elementary schools, while these supports account for $199 per pupil (5 percent) and $258 (6 percent) of middle and high school personnel spending, respectively. In contrast, approximately $1,292 (or 12 percent) of per pupil personnel expenditures are allocated to these *other education support services* in vocational schools.

Related Services

Related services account for only about $27, $9, and $7 per pupil (less than 1 percent) of elementary, middle, and high school budgets, but they account for $1,038 (about 9 percent) of personnel spending at the special needs schools.

Personnel Expenditure by Position and Assignment

Table IV-2 presents more detailed information about staff assignments within only the instructional services. (Similar detail could also be provided for other services, but to save space, only the instructional services have been broken out in this table to illustrate how this detail is coded within the personnel database.) Within each position (e.g., regular teaching assignment or special education teaching assignment), the detail reveals that additional services are provided to certain special needs populations within non-special education teaching positions. For example, students with disabilities receive services from staff categorized under more than just *special education teaching assignments*. In elementary schools, students with disabilities show up not only under *special education teaching assignments*, but also under *regular teaching assignments* ($3 per pupil), *tutor/small group instructors* ($16 per pupil), and *teaching aide assignments* ($17 per pupil). Furthermore, gifted and talented students account for some portion ($18 per pupil) of the *special education teaching assignments* as well as *regular teaching assignments* and *teaching aide assignments*. Similarly, Title I program expenditures for personnel show up not only under *remedial specialist* ($27 per pupil), but also under *regular teaching assignments* ($16 per pupil), *special education teaching assignments* ($1 per pupil), *tutor/small group instructor* ($15 per pupil), and *teaching aide assignment* ($6 per pupil).

Table IV-2. Weighted Mean Value of Personnel Expenditure per Pupil by Staff Position and Assignment for Each School Type and Central District Office for Public Schools in the State of Ohio, 1995–96 School Year

Position Descriptions Program Assignment	Weighted Mean of Actual Personnel Expenditures per Pupil					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Instructional Services						
Regular Teaching Assignment						
General	$1,851	$1,924	$1,718	$1,154	$1,569	$33
LEP	3	31	52	0	0	0
Title I Programs	16	2	1	0	0	0
Gifted and Talented	1	1	0	0	0	0
Students w/disability	3	2	1	0	0	0
Vocational	0	0	1	0	0	0
Special Education Teaching Assignment						
General	2	2	3	0	11	2
Title I Programs	1	0	0	0	0	0
Disadvantaged Pupils	0	0	0	0	0	0
Gifted and Talented	18	21	1	30	0	4
Students w/disability	259	307	200	4,633	215	9
Vocational Education Teaching Assignment						
General	0	42	190	183	2,568	2
Vocational	0	28	127	269	1,245	1
Educational Services Teacher						
General	172	163	38	25	0	42

continued

Table IV-2. Weighted Mean Value of Personnel Expenditure per Pupil by Staff Position and Assignment for Each School Type and Central District Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions Program Assignment	Weighted Mean of Actual Personnel Expenditures per Pupil					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Special Education Supplemental Services Teacher						
General	0	1	1	0	0	1
Remedial Specialist						
General	49	24	12	0	100	3
LEP	2	1	0	0	0	0
Title I Programs	27	14	1	0	0	1
Students w/disability	0	0	0	27	0	0
Tutor/Small Group Instructor						
General	8	8	7	42	19	10
LEP	2	0	1	0	0	1
Title I Programs	15	3	0	36	$	1
Students w/disability	16	25	17	41	22	5
Other Special Programs	1	2	2	0	0	1
Adult Education Teacher						
General	0	0	0	38	0	4
Adult/Continuing Education	0	0	1	0	0	0
Teaching Aide Assignment						
General	74	39	32	628	237	8
Title I Programs	6	0	0	6	0	0
Students w/disability	17	12	10	285	4	1
Other Special Programs	1	1	2	0	0	0

Personnel Measured as Physical Ingredients

Tables IV-3 and IV-4 provide an alternative display of data on school personnel. These two tables are organized in a similar fashion to table IV-1 (i.e., by staff position for each school type or central office). The difference is in the way personnel resources are quantified. Up to this point, resources have been presented as dollars or dollars per pupil. But dollars of expenditure for any given resource reflect the product of price and quantity. Thus, variations in expenditure observed across schools or districts reflect variations in quantities as well as variations in the wages paid to personnel. And these variations in wages result from variations in qualifications (or characteristics) of the staff and other labor market factors that affect wages. Tables IV-3 and IV-4 illustrate two dimensions of the quantity of personnel services: full-time-equivalents (subsequently referred to as FTEs) and the number of stipends, respectively. One FTE corresponds to one full-time staff member, while 0.5 corresponds to one half-time staff member.[15] A stipend is a fixed rate of pay for a given service and is not tied to specific hours spent in providing the service, though districts generally have a figure in mind when they see the value of the stipend. Stipends are often used to pay individuals for taking on assignments to coach high school sports or to chair a particular subject matter department.

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[15] For staff such as office workers, custodians, or aides, when hours per week rather than FTEs are reported in the ODE database, FTEs are defined based on a fixed algorithm which depends on the type of building in which the person is employed (i.e., school or central office) and the type of position.

Full-time Equivalencies (FTEs)

Table IV-3 presents the weighted mean value of FTE staff per 1,000 pupils by position for each school type and central office. Highlights of this table appear below.

- *Regular Teaching Assignments*

About half of the total FTE staff are accounted for by individuals holding *regular teaching assignments* in elementary (42.90 out of 83.83 FTEs), middle (45.19 out of 87.79 FTEs), and high schools (42.75 out of 87.68 FTEs). Another way to present this same information is in total pupils per FTE. Inverting these figures, indicates that the ratio of pupils to staff with *regular teaching assignments* is about 23 for elementary, 22 for middle schools, and about 23 for high schools. The number of regular teachers per 1,000 pupils is substantially lower in vocational schools where only a relatively small proportion of the classes or courses are devoted to regular education.

- *Special Education Teaching Assignments*

Special education teacher assignments amount to 90.88 FTEs per 1,000 pupils, which translates to about 11 pupils for every staff member, in special needs schools. (Note that the special needs schools also include some regular teachers because some portion of these schools are not special education, but alternative schools serving regular students.) *Special education teaching assignments* also appear in regular elementary, middle, and high schools, though in substantially smaller numbers since

only about 12 percent of the students in these schools, on average, are eligible for special education.

- *Vocational Education Teaching Assignments*

Vocational schools employ 71.66 staff with *vocational education teaching assignments* for every 1,000 pupils in these schools. This amounts to about 14 students (= 1,000/71.66) for every such staff member.

- *Teaching Aide Assignments*

Again elementary schools lead middle and high schools in terms of the FTE numbers of teacher aides. There is about one FTE aide for every 7.2 teachers (= 42.90/5.94) in elementary schools, while in high schools there is one aide for every 18 teachers (= 42.75/2.34).

Table IV-3. Weighted Mean Value of FTE Staff per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year

Position Descriptions	Weighted Mean of FTE Staff per 1,000 Pupils by School Type					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Instructional Services						
Regular teaching assignment	42.90	45.19	42.75	23.79	29.46	0.82
Special education teaching assignment	6.32	7.43	4.55	90.88	4.13	0.34
Vocational education teaching assignment	0.02	1.44	6.85	8.16	71.66	0.06
Educational services teacher	3.76	3.56	0.87	0.69	0.00	0.99
SE supplemental services teacher	0.01	0.02	0.02	0.00	0.00	0.02
Remedial specialist	1.71	0.77	0.24	0.49	1.65	0.10
Tutor/small group instructor	1.18	1.12	0.80	3.13	0.91	0.51
Adult education teacher	0.00	0.01	0.04	1.02	0.00	0.10
Teaching aide assignment	5.94	2.96	2.34	48.03	10.76	0.56
Other Education Support Services						
Professional — educational	0.00	0.00	0.00	0.00	0.00	0.00
Curriculum specialist	0.05	0.02	0.03	0.00	2.31	0.08
Counseling assignment	0.47	2.19	2.83	1.18	2.97	0.24
Librarian/media	0.37	1.07	1.21	0.00	0.99	0.13
Audio-visual	0.00	0.01	0.10	0.00	0.33	0.02
Other vocational personnel	0.00	0.01	0.20	0.00	5.53	0.01
Other professional — educational	0.10	0.26	0.32	0.49	9.56	0.47
Related Services						
Psychologist	0.04	0.05	0.07	2.40	15.10	0.37
Speech and language therapist	0.02	0.00	0.00	4.90	0.00	0.02
Physical therapist	0.41	0.11	0.03	3.99	0.05	0.44

continued

Table IV-3. Weighted Mean Value of FTE Staff per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean of FTE Staff per 1,000 Pupils by School Type					Central District Office
	Elementary School	Middle School	High School	Special Needs School	Vocational School	
Occupational therapist	0.03	0.01	0.01	7.35	0.00	0.02
Mobility therapist	0.00	0.00	0.00	0.49	0.00	0.00
Educational interpreter	0.04	0.05	0.06	0.00	0.00	0.01
Parent mentor	0.03	0.00	0.00	1.47	0.00	0.00
Other Professional Support						
Physician	0.00	0.00	0.00	0.00	0.66	0.00
Nursing assignment	0.19	0.18	0.17	1.26	0.43	0.35
Dental assignment	0.00	0.00	0.00	0.00	0.00	0.00
Social work assignment	0.01	0.01	0.02	0.00	0.66	0.03
Other professional assignment	0.09	0.06	0.07	1.87	1.32	0.22
Technical Assignment						
Other library media	1.39	0.81	0.64	1.84	0.66	0.07
Other technical	0.05	0.04	0.14	0.98	0.00	0.23
Extracurricular/Intracurricular Activities						
Advisor	0.01	0.03	0.12	0.00	0.00	0.01
Coaching assignment	0.02	0.21	0.36	0.00	0.00	0.03
Athletic trainer	0.00	0.00	0.01	0.00	0.00	0.00
Other extra/intracurricular activities	0.05	0.03	0.08	0.00	0.00	0.01

continued

Table IV-3. Weighted Mean Value of FTE Staff per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean of FTE Staff per 1,000 Pupils by School Type					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Administrative & General						
Assistant deputy/associate superintendent assignment	0.00	0.00	0.01	0.00	0.33	0.12
Asst principal assignment	0.19	1.15	1.46	1.47	1.32	0.01
Foreman assignment	0.01	0.02	0.03	0.00	0.00	0.07
Ombudsman assignment	0.00	0.00	0.00	0.00	0.00	0.00
Principal assignment	2.27	1.71	1.29	5.78	3.63	0.09
Superintendent assignment	0.00	0.00	0.02	0.00	0.00	0.34
Supervising/managing/directing assignment	0.04	0.09	0.38	5.39	3.07	0.91
Treasurer assignment	0.00	0.00	0.02	0.00	0.00	0.36
Coordinator	0.04	0.06	0.33	9.30	2.31	0.26
Education administrative specialist	0.00	0.00	0.02	0.00	0.00	0.06
Other official/administrative	0.03	0.08	0.17	0.00	0.66	0.20
Other office workers	3.28	3.61	4.83	15.98	19.89	2.69
Maintenance						
General maintenance assignment	0.07	0.12	0.25	0.00	0.66	0.58
Operative						
Vehicle operator assignment (other than buses)	0.00	0.00	0.04	0.00	0.00	0.11
Vehicle operating assignment (buses)	0.38	0.10	0.45	0.00	0.66	6.59
Equipment operating assignment	0.00	0.00	0.01	0.00	0.00	0.02
Other operative	0.00	0.01	0.01	0.00	0.00	0.09

continued

Table IV-3. Weighted Mean Value of FTE Staff per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean of FTE Staff per 1,000 Pupils by School Type					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Service Work/Laborer						
Attendance officer assignment	0.02	0.04	0.05	0.00	0.00	0.03
Custodian assignment	5.39	5.84	6.07	11.78	12.20	0.58
Food service assignment	4.98	5.84	5.81	4.09	8.49	0.70
Grounds keeping assignment	0.01	0.02	0.04	0.00	0.00	0.10
Attendant	0.25	0.17	0.13	3.92	0.00	0.13
Other service worker/laborer	0.47	0.25	0.24	0.49	3.96	0.13
Other service worker/laborer	1.19	1.03	1.03	10.80	1.98	0.40
TOTAL	83.83	87.79	87.68	273.41	218.45	21.60

Quantity of Stipends

Table IV-4 reports the weighted mean value of the number of stipends received by staff per 1,000 pupils by position for each school type and central office. While information was provided on the amounts paid for these stipends, the data in table IV-4 simply report the number of stipends paid without regard to the pay received. Stipends can range from just a few hundred to a few thousand dollars. Accounting data simply combine salaries, benefits, and stipends without regard to differences in quantities or prices per unit. The RCM data emphasize measurement, to the degree possible, in terms of quantities and prices separately. (Only the quantity data are presented here to save space.)

Table IV-4. Weighted Mean Number of Stipends Paid per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995-96 School Year

Position Descriptions	Weighted Mean Number of Stipends per 1,000 Pupils by School Type					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Instructional Services						
Regular teaching assignment	0.55	0.72	0.77	0	0	0.14
Special education teaching assignment	0.07	0.07	0.04	0	0	0.01
Vocational education teaching assignment	0	0.13	0.62	0	0	0
Educational services teacher	0.03	0.04	0.04	0	0	0.03
Special education supplemental services teacher	0	0	0.02	0	0	0
Remedial specialist	0.03	0.02	0.02	0	0	0
Tutor/small group instructor	0.06	0.15	0.09	0	0	0.03
Adult education teacher	0	0	0.02	0	0	0.01
Teaching aide assignment	0.06	0.02	0.03	0	0	0.01
Other Education Support Services						
Professional — educational	–	–	–	–	–	–
Curriculum specialist	0.33	0.35	0.38	0	0	0.02
Counseling assignment	0.1	0.32	0.47	0	0	0.03
Librarian/media	0.08	0.12	0.13	0	0	0.01
Audio-visual	0.13	0.06	0.07	0	0	0.01
Other vocational personnel	0	0.01	0.02	0	0	0
Other professional — educational	0.84	1.1	1.23	0	0	0.07

continued

Table IV-4. Weighted Mean Number of Stipends Paid per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean Number of Stipends per 1,000 Pupils by School Type					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Related Services						
Psychologist	0	0	0	0	0	0.06
Speech and language therapist	0.04	0	0	0	0	0.01
Physical therapist	0	0	0	0	0	0
Occupational therapist	–	–	–	–	–	–
Mobility therapist	–	–	–	–	–	–
Educational interpreter	–	–	–	–	–	–
Parent mentor	0.08	0	0	0	0	0
Other Professional Support						
Physician	–	–	–	–	–	–
Nursing assign	0.01	0.01	0.01	0	0	0.01
Dental assign	–	–	–	–	–	–
Social work assign	0.01	0.01	0	0	0	0
Other professional assignment	0.11	0.06	0.14	0.2	0	0.01
Technical Assignment						
Other library media	0.04	0	0.01	0	0	0
Other technical	0	0.01	0.01	0	0	0.01
Extracurricular/Intracurricular Activities						
Advisor	3.03	7.92	13.9	5.31	3.4	0.77
Coaching assignment	1.52	12.61	20.21	1.77	0.49	1.41
Athletic trainer	0	0.03	0.17	0	0	0.02
Other/extra/intracurricular activities	1.75	3.35	4.73	7.08	6.31	0.58

continued

Table IV-4. Weighted Mean Number of Stipends Paid per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean Number of Stipends per 1,000 Pupils by School Type					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Administrative & General						
Assistant deputy/associate superintendent assignment	0	0	0	0	0	0
Asst principal assignment	0	0.02	0.01	0	0	0
Foreman assignment	0	0	0	0	0	0
Ombudsman assignment	–	–	–	–	–	–
Principal assignment	0.03	0.01	0.02	0	0	0.01
Superintendent assignment	0	0	0	0	0	0
Supervising/managing/directing assignment	0.15	0.29	0.41	0	0	0.05
Treasurer assignment	0	0	0	0	0	0.01
Coordinator	0.15	0.12	0.18	0	0	0.07
Education administrative specialist	0	0	0	0	0	0
Other official/administrative	0.07	0.02	0.06	0	0	0.01
Other office workers	0.07	0.07	0.06	0.09	0	0.05
Maintenance						
General maintenance assignment	0	0.01	0.02	0	0	0.02
Other crafts and trade	0	0	0.01	0	0	0.01
Operative						
Vehicle operator assignment (other than buses)	–	–	–	–	–	–
Vehicle operating assignment (buses)	0	0.06	0.01	0	0	0.2
Equipment operating assignment	–	–	–	–	–	–
Other operative	0	0	0	0	0	0.01

continued

Table IV-4. Weighted Mean Number of Stipends Paid per 1,000 Pupils by Position for Each School Type and Central Office for Public Schools in the State of Ohio, 1995–96 School Year (continued)

Position Descriptions	Weighted Mean Number of Stipends per 1,000 Pupils by School Type					
	Elementary School	Middle School	High School	Special Needs School	Vocational School	Central District Office
Service Work Laborer						
Attendance officer assignment	0	0	0.02	0	0	0
Custodian assignment	0.17	0.17	0.11	0	0	0.01
Food service assignment	0.09	0.06	0.06	0	0	0
Grounds keeping assignment	0	0	0	0	0	0.01
Attendant	0	0	0	0	0	0
Other service worker/laborer	0.03	0.02	0.01	0	0	0.01
Other service worker laborer	0.19	0.01	0.03	0	0	0
TOTAL	9.82	27.97	44.14	14.45	10.2	3.72

This table suggests that stipends are most commonly used by high schools and middle schools to make payments to coaches. In fact, about 46 percent (20.21 out of 44.14 for high schools) of the stipends paid can be accounted for by coaching assignments. Most remaining stipends reimburse staff members who are involved in some extracurricular or intracurricular student activities.

Differences Between Accounting and Personnel Data

There are some important differences in the way accounting versus personnel data are coded. The accounting data provide information on the functions that individuals perform, while the personnel data provide information on the type of

position or assignment someone holds within the district or school. This results in some differences in the way information on instruction versus administration is presented. The instructional codes in the accounting data show, in theory, how much is spent on each level of instruction as well as the amount spent on various types of pupils. The staffing data place somewhat more emphasis on the types of services (e.g., general education, special education, vocational education) and the types of students served (e.g., students with disabilities, eligible for Title I, disadvantaged, gifted). Although organized somewhat differently, these two approaches appear to provide similar information on the allocation of instructional resources.

With respect to noninstructional services, however, the accounting and personnel data systems provide quite different information. In general, accounting data focus on the functions for which dollars are expended, while the personnel data focus on the nature of the job assignments. The accounting approach focuses on the functions performed such as business, fiscal services, general administration, or operations and maintenance. The personnel data provide more detailed information on related and support services such as psychological services, various kinds of therapy, health services, curriculum services, counseling, and library. However, with respect to administration, the personnel data tend to provide less information as to the functions performed by individuals. While operations and maintenance categories can be identified, it is difficult to identify how much is spent on business or fiscal services.

While the personnel data in this report do not precisely illustrate how an RCM database would be organized, they replicate the RCM. A true RCM database would not only provide information on the types of positions individuals hold, but also would provide information on the program area or function performed. Thus, it would

combine the best features of the accounting and personnel data systems presented in this report. Indeed, if the Ohio accounting data had more consistently reported the job codes, they would have provided information closer to that of the RCM.

However, another important feature of the RCM database that is captured in the Ohio personnel data is the physical quantity of personnel time. The RCM data emphasize the counting and reporting of resources as physical ingredients to the extent possible and reasonable. That is, personnel are reported in terms of hours of work or FTEs, and nonpersonnel resources are reported where possible as physical quantities of items (e.g., numbers of certain types of computers). The advantage to this type of reporting is that it permits examination of the extent to which variations in expenditures are associated with differences in the physical quantities of the resources as opposed to the differences in the unit prices paid for each resource. The value of breaking out the prices and quantities is best illustrated with an example presented in Chapter V.

This chapter has focused on measuring resources in terms of quantities like FTEs and stipends, but it provides little information about instructional or classroom time as in the case of a full blown RCM. This issue will be taken up in greater depth in Chapter VI.

V. Exploring the Patterns of Variation in Resources: Disentangling Quantities, Qualities, and Costs

Introduction

The previous chapter focused on identifying and reporting personnel data in terms of positions and assignments, and illustrated ways of presenting these data in terms of physical ingredients. The first part of this chapter illustrates how these data may be used to disentangle some of the factors underlying variations in the expenditures for resources across schools and districts. It creates a series of indexes of the variations in overall expenditures and demonstrates how these variations may be broken down into variations in the quantities, qualifications, and costs of the resources. Districts are classified using a taxonomy developed by the ODE, one that is commonly used to organize and report district and school data for comparative purposes.

The second part of this chapter returns to the type of information presented in Chapter IV. It describes and examines how some of the resource quantities vary across the various categories of districts in Ohio.

Indexing Quantities, Qualities, and Costs

Tables V-1 and V-2 present a series of indexes that illustrate how detailed information about the quantities and pay rates of school personnel can be used to disentangle the sources of variations in resources across schools. The resource data in these tables are presented as indexes of variations based on per pupil personnel expenditures (salaries and benefits) calculated under various assumptions. These resource measures are presented separately for each school level (e.g., elementary, middle, or high school) or type (special needs or vocational) and for the central district office.

Within school level or type, schools and districts are categorized by a district taxonomy developed by the State of Ohio to report information about their school districts. The taxonomy reflects a combination of district location (urban, suburban, or rural), poverty level of students (low versus high), socioeconomic status (SES) of the community, and district size (e.g., as reflected in small town, major urban centers). An exception to this process was the categorization of two small isolated school districts. In this analysis they will be referred to as "the two distinct school districts" or "the two distinct LSDs".

Table V-1. Alternative Indexes Comparing the Levels of per Pupil Personnel Resources Across Schools Categorized by Type (e.g., Elementary, Middle, High, Special Needs, and Vocational) Located Within Districts Categorized by Location (e.g., Rural, Urban), Student Poverty Level (Low Versus High), and the SES of the Community for Ohio Public Schools, 1995–96 School Year [a]

School Type District Type (Location, Student Poverty, & Community SES) (1)	Number of Cases (2)	Indexes of Variation in per Pupil Personnel Resources by Type of School			
		Actual Total: Actual Total Personnel Expenditure Per Pupil (in Dollars) (3)	Quantity: Actual Quantities of Personnel At State-wide Average Rates of Compensation (4)	Qualifications: Wage Variations Associated With Personnel Characteristics (5)	Input Costs: Wage Variations Associated With Costs of Living And Working in Local School Districts (6)
Elementary Schools					
The Two Distinct LSDs	2	$223.3	205.7	108.1	100.3
Rural, high poverty, low SES*	203	100.0	100.0	100.0	100.0
Rural, low poverty, low SES	291	96.8	93.1	103.6	100.3
Small town, moderate SES	290	106.5	94.0	111.9	101.1
Urban, low SES, very high poverty	261	116.4	102.4	108.4	104.8
Urban, moderate SES, average poverty	234	123.8	99.4	116.1	107.2
Major Urban, very high poverty	386	136.3	101.6	125.7	106.7
Urban/Suburban, high SES	349	122.0	96.6	120.3	104.9
Urban/Suburban, very high SES	127	138.4	100.9	127.8	107.2
Middle Schools					
Rural, high poverty, low SES*	44	100.0	100.0	100.0	100.0
Rural, low poverty, low SES	79	105.6	98.3	104.4	102.9
Small town, moderate SES	104	121.2	106.2	111.1	102.7
Urban, low SES, very high poverty	70	142.9	124.3	107.5	106.9
Urban, moderate SES, average poverty	62	153.4	121.3	116.6	108.5
Major Urban, very high poverty	94	186.6	136.5	125.1	109.3
Urban/Suburban, high SES	112	149.6	116.8	120.0	106.7
Urban/Suburban, very high SES	46	174.9	124.8	127.9	109.6
High Schools					
The Two Distinct LSDs	1	222.0	191.2	120.2	96.6
Rural, high poverty, low SES*	85	100.0	100.0	100.0	100.0
Rural, low poverty, low SES	154	103.7	98.8	104.9	100.0
Small town, moderate SES	123	115.6	101.7	112.8	100.8
Urban, low SES, very high poverty	68	124.8	107.6	111.3	104.2
Urban, moderate SES, average poverty	51	143.7	112.9	118.9	107.0
Major Urban, very high poverty	64	166.8	119.6	130.3	107.0
Urban/Suburban, high SES	90	141.9	109.7	123.3	104.9
Urban/Suburban, very high SES	40	168.9	118.5	133.4	106.8

continued

Table V-1. Alternative Indexes Comparing the Levels of per Pupil Personnel Resources Across Schools Categorized by Type (e.g., Elementary, Middle, High, Special Needs, and Vocational) Located Within Districts Categorized by Location (e.g., Rural, Urban), Student Poverty Level (Low Versus High), and the SES of the Community for Ohio Public Schools, 1995–96 School Year [a] (continued)

School Type District Type (Location, Student Poverty, & Community SES) (1)	Number of Cases (2)	Indexes of Variation in per Pupil Personnel Resources by Type of School Actual Total: Actual Total Personnel Expenditure Per Pupil (in Dollars) (3)	Quantity: Actual Quantities of Personnel At State-wide Average Rates of Compensation (4)	Qualifications: Wage Variations Associated With Personnel Characteristics (5)	Input Costs: Wage Variations Associated With Costs of Living And Working in Local School Districts (6)
Special Needs Schools					
Rural, low poverty, low SES*	1	100.0	100.0	100.0	100.0
Small town, moderate SES	1	134.5	113.2	127.3	93.3
Urban, low SES, very high poverty	1	134.8	111.6	109.6	110.1
Urban, moderate SES, average poverty	5	95.5	77.4	114.9	107.3
Major Urban, very high poverty	9	161.0	122.4	116.4	112.9
Urban/Suburban, high SES	3	211.0	137.6	132.9	115.3
Urban/Suburban, very high SES	1	266.4	155.1	152.5	112.5
Vocational Schools					
Rural, high poverty, low SES*	2	100.0	100.0	100.0	100.0
Small town, moderate SES	1	75.7	58.4	117.5	110.2
Urban, moderate SES, average poverty	1	151.7	108.3	135.9	103.1
Major Urban, very high poverty	7	206.2	133.1	150.3	103.0

[a] The figures in this table reflect the relative differences in personnel resources as measured within each column and within each category of schools. These index values should be used within types of schools or the central district office to compare relative resource levels. No comparisons across categories are possible. For example, elementary schools in Major Urban, very high poverty districts spend 36.3 percent more on personnel resources than the average rural, high poverty, low SES (socioeconomic status) district which is used as the base category for all school categories with the exception of Special Needs Schools. In this case, the Rural, low poverty, low SES category is used as the base. These index values are calculated from the weighted geometric means of the underlying index values. Geometric means reduce the impact of extreme values on the results. The weights used for these calculations are the enrollments of each school or district unit included in the table above.

* The asterisk designates the base category of district to which all other schools within the school type category are compared. Whenever possible, schools in rural, high poverty, low SES districts are used as the comparison group. The only exception is special needs schools where the category is not present.

Table V-2. Alternative Indexes Comparing the Levels of per Pupil Personnel Resources Allocated to Central Office Functions Across Districts Categorized by Location (e.g., Rural, Urban), Student Poverty Level (Low Versus High), and SES of the Community for Ohio Public Schools, 1995–96 School Year [a]

		Indexes of Variation in per Pupil Personnel Resources Allocated to Central Office Functions, by Type of District			
Central District Office (1)	Number of Cases (2)	Actual Total: Actual Total Personnel Expenditure Per Pupil (3)	Quantity: Actual Quantities of Personnel at Statewide Average Rates of Compensation (4)	Qualifications: Wage Variations Associated with Personnel Characteristics (5)	Input Costs: Wage Variations Associated with Costs of Living and Working in Local School Districts (6)
The Two Distinct LSDs	4	185.7	212.2	86.4	101.2
Rural, high poverty, low SES*	77	100.0	100.0	100.0	100.0
Rural, low poverty, low SES	154	102.9	103.4	99.4	100.1
Small town, moderate SES	122	94.9	86.1	109.4	100.7
Urban, low SES, very high poverty	65	115.4	102.5	109.2	103.0
Urban, moderate SES, average poverty	42	113.5	89.5	120.3	105.3
Major Urban, very high poverty	12	176.7	128.8	130.3	105.1
Urban/Suburban, high SES	89	110.7	87.4	121.9	103.7
Urban/Suburban, very high SES	35	118.0	86.1	130.1	105.3

[a] The figures in this table reflect the relative differences in personnel resources as measured within each column and within each category of schools. These index values should be used within or the central district office to compare relative resource levels. No comparisons across categories are possible. For example, elementary schools in Major Urban, very high poverty districts spend 22.3 percent more on personnel resources than the average Rural, high poverty, low SES district which is used as the base category for all school categories with the exception of Special Needs Schools. In this case, the Rural, low poverty, low SES category is used as the base. These index values are calculated from the weighted geometric means of the underlying index values. Geometric means reduce the impact of extreme values on the results. The weights used for these calculations are the enrollments of each school or district unit included in the table.

* The asterisk designates the base category of district to which all other types of districts are compared. Rural, high poverty, low SES districts are used as the comparison group.

The number of cases in column 2 of tables V-1 and V-2 represent the number of schools of the corresponding type located in a district, classified according to the district taxonomy. The number of cases in column 2 in table V-2 represents the number of districts which are classified according to the taxonomy.

Column 3 presents an index of variation in actual total personnel expenditures per pupil. This figure is calculated based on the detailed staffing data provided by the ODE. Each record in the original file represents the allocation of an individual employee's time coded by position and assignment within a school or central office. The expenditure on this employee's compensation is determined by the rate of pay multiplied by the actual allocation of time to the employee for that position and assignment, plus an estimated expenditure on benefits derived from district level benefit and salary information from the accounting file.[16] Stipend payments for employees are also reflected in these data. For those employees assigned to a given school, the expenditure on total employee compensation is then divided by the total number of pupils enrolled in the school. For those employees assigned to the central district office of the school, the expenditure on total employee compensation is then divided by the total number of pupils enrolled in the entire district. No effort was made at this stage of the analysis to assign expenditures to specific categories of students served. Thus, the index in column 3 should reflect the actual overall level of per pupil expenditure across public schools and central offices in the State of Ohio for

[16] Benefits rates are estimated by district using data on total salaries and total benefits paid for certified and noncertified school personnel. Separate benefit rates are calculated for certified and noncertified school personnel. The portion of the benefits which could not be specifically assigned to certified or noncertified personnel is apportioned based on the relative expenditures on benefits. This procedure should involve little bias in the estimates since that portion of benefits which could not be assigned to certified or noncertified personnel was a relatively small percentage of the total (i.e., less than 1 percent of total expenditures).

the 1995-96 school year. (A more detailed linking of students to resources is saved for the discussion in Chapter VI.)

The index in column 4 addresses the following question:

How much of the variation in expenditure on school personnel across schools and districts is due to differences in the quantities and intensities of various types of school personnel?

In order to calculate this index, the pay rates of school personnel are *standardized* across the state by position. That is, the index of variation in expenditures is estimated as in column 3 with one exception: all personnel with the same position code are assigned the same annual or hourly rate of pay across the state. In this case, the mean value of all pay rates across the state is assigned to each individual employee. Variations across schools and districts in this standardized index (column 4) only reflect variations in the quantities and composition of school and district personnel per pupil. Variations in the salaries paid to employees in comparable positions (e.g., classroom teachers or school principals) across districts have been removed from this index. That is, variations in this index only reflect variations in the FTE numbers of teachers, principals, aides, custodians, or district administrators per pupil and not variations in the rates of pay for these individuals across districts or schools.

Column 5 estimates the variations across schools and districts in the qualifications and characteristics (e.g., age, experience, education, quality of college attended, race-ethnicity) of school and district personnel. Specifically, the index presented in column 5 reflects the variations in per pupil personnel resources

associated with the estimated wage variations related to the personal qualifications and characteristics of school and district employees. This index is estimated through a series of steps which is not directly reflected in tables V-1 and V-2. These steps are described below.

- *Step 1. Develop cost indexes for personnel inputs.*

  The input cost indexes are derived from a national study conducted by Chambers (1997). This study developed a separate input cost index for each of two categories of certified public school personnel and four categories of noncertified public school personnel. The categories of personnel include the following:

  Certified

  - teachers
  - administrators

  Noncertified

  - Management, business, and technical personnel
  - Building, grounds, and maintenance staff
  - Secretary, clerical, office staff, and
  - Paraprofessionals (teachers' assistants or aides)

  Each of the six input cost indexes addresses the following question:

  > *How much more or less does it cost to recruit and employ comparable personnel across the districts in the state?*

  In this case, the term *comparable personnel* refers not only to comparable positions, but also comparable characteristics. Each of these indexes is based on a statistical analysis that attempts to capture all of the

factors that affect pay rates for each category of personnel. Two categories of factors are identified: *discretionary factors* and *cost factors*. The *discretionary factors* include those that are within district control and include specific personal and job assignment characteristics. The notion is that districts have control over who they hire and, to some degree, the specific characteristics of the jobs within the district to which they assign individuals. The *cost factors* include those that are outside the control of district decision makers. For example, the *cost factors* include variations in the cost of living and the characteristics of a community or region such as crime rates, climate, and urbanicity, which affect the supply of school personnel in certain regions.[17]

- *Step 2. Calculate cost-adjusted expenditures*

  Cost-adjusted expenditures are calculated by dividing actual total expenditures for each position within a school or district by the relevant input cost index. The cost-adjusted expenditures represent variations in the *real expenditures*, and they include variations in the quantities and qualifications of school inputs available to students within the school or district. Variations in the prices of inputs that are outside local control (i.e., reflect the *cost factors*) are factored out of this index.

- *Step 3. Isolate the variations in qualifications*

  This is achieved by dividing the cost-adjusted expenditures by the standardized expenditures (i.e., those reflected in the index in column 4, which represent the differences in quantities of inputs).

Column 6 reflects the variations in input costs. This index reflects the variations in the cost of purchasing the existing levels of inputs in each school or district using

[17] For a more detailed discussion of the development of these cost indexes, see Chambers (1997a).

wage levels that reflect only the *cost factors*: that is, those factors that affect the costs of living and working in local school districts across the State of Ohio.[18]

Columns 4, 5, and 6 combined reflect all of the components of the variation in actual expenditures: quantities of personnel inputs, qualifications (or characteristics) of personnel inputs, and costs of personnel inputs. It should be noted that all indexes have been re-scaled so that an index value of 100 is associated with the schools or central offices located in districts classified as rural, high poverty, low SES, with the exception of special needs schools. For special needs schools, districts classified as rural, low poverty, low SES are used as the base.

The rural, high poverty, low SES districts are used as the base because they are generally the lowest spending class of districts. What does it mean to say that these are the lowest spending districts.

Do they:

- face lower pay rates for comparable personnel (i.e., face lower input costs),
- buy fewer personnel inputs, or
- purchase lower "quality" inputs?

The following discussion addresses these questions, as reflected by the data in

[18] It should be noted that this is not the same as a "true cost" index or even a *fixed market basket* cost index. The market basket in this case is not fixed across districts, but rather reflects actual purchases of the personnel inputs of the schools and districts included in the analysis. However, the prices in this case reflect variations in the wage rates associated with traditional cost indexes: that is, they control for variations in the characteristics and qualifications of personnel.

tables V-1 (the analysis of school spending patterns) and V-2 (the analysis of central office spending patterns). Excluding the two distinct school districts (which represent special circumstances as described below), table V-1 tends to show that spending variations at the school level tend to exhibit less variance in elementary schools than in schools at higher grade levels (i.e., middle and high schools) or schools serving special populations (i.e., special needs students or students focused on vocational programs). The source of this difference appears to lie in variations in the quantities of personnel resources that are relatively small across elementary schools in the different categories of districts. These results are described in somewhat more detail below.

- *Highlights of School Spending Patterns (Table V-1)*

  - *Major urban, very high poverty districts.* Excluding the two distinct districts, the major urban, very high poverty districts experience either the highest or second highest spending among the various types and levels of schools (see column 3). These districts are important because they generally serve the most needy populations of students. These same districts commonly are thought to face higher input prices. The data confirm these impressions.

    - *Elementary level.* The major urban districts spend 36.3 percent more on elementary school personnel than the rural, high poverty, low SES districts. They spend 1.6 percent more for greater quantities of school personnel resources (column 4), 25.7 percent more on personnel

qualifications (column 5), and pay about 6.7 percent more for personnel with comparable qualifications (column 6).

- *Middle school level.* The numbers are more dramatic at the middle school than the elementary school level. In their middle schools, these major urban districts spend 86.6 percent more on school personnel than the rural, high poverty, low SES districts. They spend 36.5 percent more for greater quantities of school personnel resources, 25.1 percent more on personnel qualifications, and pay 9.3 percent more for comparable inputs relative to rural, high poverty, low SES districts.

- *High school level.* Again the high school differences are more dramatic than the elementary differences. In the high schools, these major urban districts spend 66.8 percent more on school personnel than the rural, high poverty, low SES districts. They spend 19.6 percent more for greater quantities of school personnel resources, 30.3 percent more on personnel qualifications, and 7 percent more for comparable inputs relative to rural, high poverty, low SES districts.

- *Vocational and special schools.* To some degree, the vocational and special school differences are similar to the high school differences, but care must be taken in drawing

any conclusions because of the small sample of such schools.

- *Urban/Suburban, very high SES districts.* These districts are important because they are more than likely the districts enrolling students from the wealthier communities in the state. It turns out that these districts share one thing in common with the major urban, very high poverty districts. Excluding the two distinct school districts, these urban/suburban, very high SES districts are either the highest or second highest spending districts at each school level. The image of these districts is that they are commonly located in high cost areas of the state and that they provide programs which are relatively rich on both quantity and quality dimensions. The data at each level tend to support this image.

  - *Elementary level.* These urban/suburban, very high SES districts spend 38.4 percent more on elementary school personnel than the rural, high poverty, low SES districts. They spend 0.9 percent more for greater quantities of school personnel resources (0.7 less than the major urban, very high poverty districts), 27.8 percent more for personnel with higher qualifications, and they pay slightly more than 7.2 percent higher costs for comparable inputs which is similar to their major urban, very high poverty counterparts. These urban/suburban, very high SES districts

spend about 2.1 percent more in their elementary schools than the major urban, very high poverty districts on personnel qualifications.

- *Middle school level.* The numbers again are more dramatic at the middle school level than the elementary level. In their middle schools, these urban/suburban, very high SES districts spend about 74.9 percent more on school personnel than the rural, high poverty, low SES districts. They spend 24.8 percent more to obtain greater quantities of school personnel resources, 27.9 percent more to obtain personnel with greater qualifications, and pay almost 9.6 percent higher costs for comparable inputs relative to rural, high poverty, low SES districts. However, once again these urban/suburban, very high SES districts show an advantage of about 2.8 percent (= 127.4 - 125.1) in personnel qualifications over the major urban, very high poverty districts.

- *High school level.* Again, the high school differences are more dramatic than the elementary differences. In the high schools, these urban/suburban, very high SES districts spend about 68.9 percent more on school personnel than the rural, high poverty, low SES districts. This is a comparable difference to that for the major urban, very high poverty districts. The very high SES districts spend

18.5 percent more on greater quantities of school personnel resources, spend 33.4 percent more on personnel qualifications, and pay about 6.8 percent higher costs for comparable inputs relative to rural, high poverty, low SES districts. Again, the urban/suburban, very high SES districts employ high school personnel who show about a 3.1 percent advantage in personnel qualifications over the major urban, very high poverty districts.

- *The two distinct school districts.* The two distinct school districts reflect outliers in terms of spending. On average, these districts spend more than twice as much at the elementary and high school levels than do the rural, high poverty, low SES districts for these same school levels. For the most part, the spending patterns of these unique local school districts suggest that differences in the quantities of personnel account for virtually all of the differences in spending between the rural, high poverty, low SES districts, and the two distinct districts.

- *Highlights of Central Office Spending Patterns (Table V-2)*

  - *Major urban, very high poverty districts.* Excluding the two distinct districts, the *major urban, very high poverty* district central offices spend substantially more than the rest of the districts. In particular, the central offices of the *major urban, very high poverty* districts spend 76.7 percent more per pupil than the rural, high poverty, low SES districts. However, these major urban districts spend this additional money to increase both the quantities of central office personnel (by 28.8 percent) and the qualifications of central office personnel (by 30.3 percent) to support the needs of the children they serve. Input costs are about 5.1 percent higher for the major urban, very high poverty districts.

  - *Urban/Suburban, very high SES.* In contrast to the major urban, very high poverty districts which spend almost 77 percent more than the rural, high poverty, low SES districts, the urban/suburban, very high SES districts serving the wealthier communities spend only about 18 percent more per pupil in personnel resources than the rural, high poverty, low SES districts. This may not be surprising if one believes that there are substantially more administrative costs in the major urban, very high poverty districts than these very high SES districts. However, the very high SES districts spend about 13.9 percent *less* on the quantities of central office personnel, but about 30.1 percent more on personnel qualifications than rural, high poverty, low SES

districts. Input costs for comparable inputs are about 5.3 percent higher.

- *The two distinct school districts.* As one would expect, the two distinct school districts reflect outliers in terms of central office spending as well as school spending. On average, these districts spend about 85.7 percent more in their central offices than do the rural, high poverty, low SES districts. Unlike the patterns of difference for the schools (table V-1), the central office spending exhibits even larger percentage differences associated with the quantities of school personnel (212.2 percent higher spending) relative to the rural, high poverty, low SES districts. This substantial difference in the quantity of district personnel is offset by the purchase of personnel with substantially lower levels of qualifications (approximately 13.6 percent lower) than those of the rural, high poverty, low SES districts.

One important bias that may exist in the central office findings is that the input cost indexes developed by Chambers (1997) and used for this study only included school level administrators in the wage analysis. The problem with this is that it is not possible to address the impact that district size has on both the quality and cost dimensions associated with recruiting district level administrators. It is fairly common knowledge that larger districts pay higher salaries to district level administrators than smaller districts. To some degree, this higher compensation is related to the greater level of responsibility and work effort required in larger and more complex organizations (e.g., like big city school districts). However, to some degree, this higher compensation may result from these large school districts having to employ more

highly skilled and qualified executives because of the greater levels of responsibility involved in these jobs[19]. Subsequent analyses using better indexes for district level administrative personnel may provide improved estimates of costs that could easily rearrange the patterns of differences in personnel associated with input costs versus personal qualifications.

What Underlies the Differences across Categories of Districts?

Tables V-1 provides overall indexes of spending for various types of schools in districts classified according to the ODE's taxonomy of local school districts. Another question of interest might be, what specific patterns of resource allocation underlie these index numbers? That is, for what specific kinds of personnel do these different categories of districts utilize these dollars. Table V-3 presents specific differences in the quantities of various categories of school personnel employed between schools (elementary and high school taken separately) in four of the nine different categories of districts included in the ODE taxonomy: the two distinct school districts; the rural, high poverty, low SES; major urban, very high poverty; and urban, suburban, very high SES districts. For the purpose of simplicity, only elementary and high schools are included in these four categories of districts. Differences revealed in Table V-3 are highlighted below.

[19] For a more complete discussion of the factors affecting executive compensation, the reader see Roberts (1956), a classic article on the subject.

Table V-3. Weighted Mean Values of FTE Quantities of Personnel per 1,000 Pupils for All Schools by School Type Within Each District Taxonomy Classification

Position	Elementary Schools				High Schools			
	The Two Distinct LSDs	Rural, High Poverty, Low SES	Major Urban, Very High Poverty	Urban/ Suburban, Very High SES	The Two Distinct LSDs	Rural, High Poverty, Low SES	Major Urban, Very High Poverty	Urban/ Suburban, Very High SES
Instructional services								
Regular teaching assignment	124.2	45.09	42.15	43.59	136.05	39.38	39.54	52.05
Special education teaching assignment	0	7.19	8.48	4.98	0	5.65	7.32	3.27
Vocational education teaching assignment	0	0.04	0.02	0	0	6.8	12.41	3.2
Educational services teacher	18.52	2.03	4.09	5.87	0	0.98	0.28	1.25
Special education supplemental services teacher	0	0.05	0.02	0	0	0.02	0.01	0
Remedial specialist	0	2.33	1.85	0 87	0	0.23	0.79	0.29
Tutor/small group instructor	0	0.34	0.35	2	0	0.36	0.15	1.58
Adult education teacher	0	0	0	0	0	0	0	0
Teaching aide assignment	0	5.47	8.23	4.95	0	1.6	4.12	2.91
Other Education Support Services								
Professional — educational	0	0	0	0	0	0	0	0
Curriculum specialist	0	0	0.17	0.1	0	0.02	0.1	0.1
Counseling assignment	0	0.4	0.39	0.92	0	2.34	2.5	3.55
Librarian/media	0	0.25	0.36	1.36	0	1.6	1.06	1.11
Audio-visual	0	0	0.01	0	0	0	0.53	0.1
Other vocational personnel	0	0	0	0	0	0.1	0.54	0.02
Other professional — educational	0	0.02	0.18	0.16	0	0.15	0.91	0.9
Related Services (possible Pull-out)								
Psychologist	0	0	0.02	0.09	0	0.01	0.29	0.09
Physical therapist	0	0	0.07	0.01	0	0	0.02	0
Speech and language therapist	6.17	0.17	0.76	0.7	0	0	0.15	0.08
Occupational therapist	0	0	0.12	0.01	0	0	0.04	0
Mobility therapist	0	0	0.02	0	0	0	0.01	0
Educational interpreter	0	0.03	0.09	0.03	0	0	0.19	0.07
Parent mentor	0	0	0.13	0	0	0	0	0

continued

Table V-3. Weighted Mean Values of FTE Quantities of Personnel per 1,000 Pupil for All Schools by School Type Within Each District Taxonomy Classification (continued)

Position	Elementary Schools				High Schools			
	The Two Distinct LSDs	Rural, High Poverty, Low SES	Major Urban, Very High Poverty	Urban/ Suburban, Very High SES	The Two Distinct LSDs	Rural, High Poverty, Low SES	Major Urban, Very High Poverty	Urban/ Suburban, Very High SES
Other Professional Support								
Physician	0	0	0	0	0	0	0	0
Nursing assignment	0	0.05	0.27	0.48	0	0.09	0.33	0.34
Dental assignment	0	0	0	0	0	0	0	0
Social work assignment	0	0	0.02	0.05	0	0	0	0.02
Other professional assignment	0	0	0.31	0.08	0	0.02	0.08	0.13
Technical Assignment								
Other library media	0	1.16	0.98	1.22	0	0.46	0.35	1.16
Other technical	0	0.06	0.02	0.06	0	0.09	0.14	0.17
Extracurricular/Intracurricular Activities								
Advisor	0	0	0	0	0	0.02	0	0.05
Coaching assignment	0	0.02	0	0	0	0.11	0.02	0.62
Athletic trainer	0	0	0	0	0	0	0	0.11
Other extra/intracurricular activities	0	0.05	0	0.1	0	0	0	0.05
Administrative & General								
Assistant deputy/associate superintendent assignment	0	0	0	0	0	0	0	0.02
Assistant principal assignment	0	0.11	0.4	0.35	0	0.69	2.69	1.49
Foreman assignment	0	0	0	0	0	0.02	0	0.02
Ombudsman assignment	0	0	0	0	0	0	0	0
Principal assignment	0	2.3	1.99	1.93	0	1.89	0.74	1.02
Superintendent assignment	0	0.02	0	0	0	0.02	0	0
Supervising/managing/directing assignment	0	0.06	0.03	0	0	0.14	0.51	0.38
Treasurer assignment	0	0.02	0	0	0	0.02	0	0
Coordinator	0	0.02	0.01	0.05	0	0.09	0.45	0.26
Education administrative specialist	0	0	0	0.01	0	0	0.03	0
Other official/administrative	0	0.05	0:02	0.03	0	0.23	0.21	0.11
Other office workers	0	3.49	3.4	3.1	0	3.63	5	5.62

continued

Table V-3. Weighted Mean Values of FTE Quantities of Personnel per 1,000 Pupil for All Schools by School Type Within Each District Taxonomy Classification (continued)

Position	Elementary Schools				High Schools			
	The Two Distinct LSDs	Rural, High Poverty, Low SES	Major Urban, Very High Poverty	Urban/ Suburban, Very High SES	The Two Distinct LSDs	Rural, High Poverty, Low SES	Major Urban, Very High Poverty	Urban/ Suburban, Very High SES
Maintenance								
General maintenance assignment	0	0.04	0.04	0.11	0	0.18	0.22	0.35
Other crafts and trade	0	0.02	0	0	0	0.08	0.04	0
Operative								
Vehicle operating assignment (other than buses)	0	0.01	0	0	0	0.02	0.04	0
Vehicle operating assignment (buses)	0	1.55	0	0	0	2.61	0	0
Equipment operating assignment	0	0	0	0	0	0	0	0
Other operative	0	0	0	0	0	0.02	0	0.02
Service Work/Laborer								
Attendance officer assignment	0	0	0.08	0	0	0.02	0.08	0.07
Custodian assignment	0	5.52	5.76	5.32	0	5.39	6.31	7.27
Food service assignment	0	6.82	4.15	2.72	0	5.12	4.83	3.79
Grounds keeping assignment	0	0	0	0.05	0	0.02	0	0.02
Attendant	0	0.1	0.17	0.76	0	0.09	0.17	0.32
Other service worker/laborer	0	0.09	1.35	0.26	0	0.1	0.74	0.12
Other service worker laborer	0	0.24	0.45	1.06	0	0.29	2.09	0.89

- *For Elementary Schools*

  - *Regular teaching assignments.* The two distinct districts employ more than 2.7 times as many regular teachers as the other three categories of districts (i.e., 124.2 versus 42.15 to 45.09 per 1,000 pupils). But there is relatively little difference at the elementary level in the numbers of regular teachers per 1,000 pupils. That is,

there is not much difference in regular class size across these three categories of districts at the elementary level.

- *Special education teaching assignments.* Major urban districts employ about 70 percent more individuals in special education teaching assignments than the high SES districts (i.e., 8.48 versus 4.98 or about 3.5 more per 1,000 total pupils).

- *Educational services teachers.* The high SES districts make much greater use of educational services teachers than do either the major urban or the rural districts displayed in the table.

- *Remedial specialists.* On the other hand, the rural districts appear to make greater use of remedial specialists than either the major urban or the high SES districts.

- *Teacher aides.* It appears that the major urban districts make greater use of teacher aides than do either of the other two categories of districts. These major urban districts employ 8.23 aides for every 1,000 pupils enrolled in elementary schools, while the rural and high SES districts employ 5.47 and 4.95 aides for every 1,000 pupils enrolled in elementary schools, respectively.

- *Counselors and librarians.* The high SES districts appear to employ more counselors (0.92 per 1,000 pupils enrolled) and library/media specialists (1.36 per 1,000 pupils enrolled) than do

the major urban (0.39 counselors and 0.36 library/media specialists per 1,000 pupils) or the rural (0.4 counselors and 0.25 library/media specialists per 1,000 pupils) districts.

- *Principals and school size.* Based on the count of elementary principals, these data suggest that the average elementary school size (i.e., 435 =1000/2.3) is probably lower in the rural districts than in either of the other two categories of districts, both of which exhibit school sizes greater than 500 students.

- *Food service workers.* The rural districts appear to employ more food service workers per 1,000 pupils enrolled (6.82) than do either the *major urban* (4.15) or the *high SES* (2.72) districts.

- *For High Schools*

  - *Regular teaching assignments.* The two distinct districts employ more than 3.4 times as many regular teachers as the rural and major urban districts in the table (i.e., 136.05 versus 39.38 and 39.54 per 1,000 pupils, respectively). The high SES districts exhibit a considerably greater investment in the quantities of regular teachers (52.05) than do the major urban or rural districts.

  - *Special education teaching assignments.* Although the numbers in each case are smaller for high schools than elementary schools, the major urban districts employ more than 120 percent more

individuals in special education teaching assignments than the high SES districts (i.e., 7.32 versus 3.27 or about four more per 1,000 total pupils).

- *Remedial specialists.* Though the absolute levels are not large, the data suggest that major urban districts make greater use of remedial specialists (0.79 per 1,000 pupils) than do high SES (0.29) or rural districts (0.23).

- *Teacher aides.* As in the case of elementary schools, it appears that the major urban districts make greater use of teacher aides than do either of the other two categories of districts. These major urban districts employ 4.12 aides for every 1,000 pupils enrolled in elementary schools, while the rural and high SES districts employ about 1.6 and 2.91 aides for every 1,000 pupils enrolled in high schools, respectively.

- *Counselors and librarians.* The high SES districts appear to employ more counselors (3.55 per 1,000 pupils enrolled) than do the major urban (2.50 counselors per 1,000 pupils) or the rural (2.34 counselors per 1,000 pupils) districts. However, the rural districts appear to employ more library/media specialists (1.6 per 1,000 pupils enrolled) than do the major urban (1.06 library/media specialists per 1,000 pupils) or the high SES (1.11 library/media specialists per 1,000 pupils) districts represented in the table.

- *Principals and school size.* Based on the count of high school principals, these data suggest that the average high school size is probably lower in the rural districts (i.e., 529 = 1000/1.89) than in major urban (i.e., 1,351 = 1000/0.74) or the high SES (i.e., 980 = 1000/1.02) districts. Rural districts may have smaller high schools because of the lack of a critical mass of students by grade level, but high SES districts may consciously have chosen to have smaller schools.

- *Food service workers.* The rural districts appear to employ more food service workers per 1,000 pupils enrolled (5.12) than do either the major urban (4.83) or the high SES (3.79) districts.

Summary

This chapter has illustrated ways of disentangling patterns of variation in spending by breaking up expenditure into its component parts: prices and quantities. Using separate analyses conducted by Chambers (1997) on prices of personnel resources, these prices were divided into two components: one associated with variations in the qualifications of personnel and one associated with variations in the costs of personnel in different labor markets. Spending patterns across schools and districts could then be divided into their component parts reflecting variations in quantities, qualifications, and costs of the various resources. The highlights of this analysis suggested that for all but elementary schools, variations in expenditures resulted from fairly wide variations in both the quantities and qualifications of school personnel employed across different kinds of districts. The two highest spending

categories of districts were the major urban districts serving very high poverty student populations and the urban/suburban districts serving students with very high socioeconomic status. The lowest spending districts were the rural districts serving students from very high poverty and low SES families. For elementary schools, the variations in quantities of resources were substantially less important and variations in expenditures were substantially smaller across the categories of districts displayed in this analysis. Variations in elementary schools were largely attributable to variations in the qualifications of school personnel.

To understand the differences in the composition of personnel, these same categories of districts were used to explore the patterns of FTE employees by position. Though the major urban, very high poverty districts had similar levels of spending when compared to the urban/suburban, very high SES districts, the allocations of resources were quite different among different types of staff. For example, in high schools, the urban/suburban, very high SES districts purchased relatively larger quantities of FTEs in regular teaching assignments than their major urban, very high poverty counterparts (52.05 FTEs per 1,000 pupils versus 39.54 FTEs per 1,000 pupils). The major urban, very high poverty districts employed relatively greater quantities of special education teachers (7.32 FTEs per 1,000 pupils versus 3.27 FTEs per 1,000 pupils), vocational teachers (12.41 FTEs per 1,000 pupils versus 3.2 FTEs per 1,000 pupils), and teacher aides (4.12 FTEs per 1,000 pupils versus 2.91 FTEs per 1,000 pupils).

VI. Costs of Service Delivery: Linking Students to Services

Introduction

The previous chapters illustrated some alternative techniques for measuring resources that permit one to decompose overall variations in spending to variations in the quantities, qualifications, and costs of comparable personnel. The next step toward development of an RCM database is to organize resources into specific service delivery systems that link resources to children served. This step provides the mechanism to decompose expenditures on instruction into the various specific subject areas and types of services which are provided to different student populations. Recognizing the service delivery system and linking students to services represent a major step toward building a true RCM database and analysis.

This chapter presents the course level data provided by the ODE management information system. The first part of this chapter shows how staff data containing information on positions, assignments, and courses taught are linked to student data which indicate aggregate counts of students enrolled by course. The second part of the chapter shows how these types of data could be used to create profiles of instructional programs for hypothetical individual students and how these programs can be used in combination with the course level data to estimate the costs of service delivery.

Course Level Data

The data for this analysis merge information from the ODE staff files with two separate course level files gathered from the individual school districts in Ohio. One file, the *Master Course File*, contains information about the specific courses or classes taught by each staff member and the other file, the *Student Course File*, contains information about the specific courses taken by students. The two files are merged using the common class location code. The class location code is established by district personnel and is unique to the district. The code identifies the school building and classroom in which the class is taught, as well as the semester and section or period number of the specific class. The combination of these two course files is then merged with the staff file by virtue of the unique individual identifier included on the staff and master course files. Based on the information contained on the three files, it is possible to estimate the FTE staff time required to provide each course or class, the total compensation (i.e., salaries and benefits) paid to the staff member for this time, the total number of hours of instructional time required for the year, and the total numbers of students served.

Table VI-1 presents a sample of the types of service delivery systems found in elementary schools, while table VI-2 provides a sample of high school service delivery systems. Column 1 lists the specific courses or classes in the typical school setting by type of school (elementary or high school) and by position-assignment of the staff member. Column 2 presents the number of cases with positive enrollments contained in the ODE database. Column 3 shows the average FTE staff per class or course corresponding to the position-assignment in column 1. Column 4 displays the average total cost of each class or course. Column 5 includes the average class size or caseload

of students served in each class or course. Column 6 contains the average cost per pupil for each class or course. Column 7 lists the average instructional hours per year reported by districts in the ODE database. Finally, column 8 presents the average cost per pupil hour of instruction for each of the courses, classes, or caseloads included in the course file.

Table VI-1. Elementary School FTE Staff Time per Class or Course, Average Class Sizes or Caseloads, and Average Expenditures per Pupil Hour of Instruction for Selected Courses and Classes in Public K-12 Schools in the State of Ohio, 1995-96

School Type Position and Assignment of Staff Description of Course or Class Taught (1)	Number of Cases* (2)	FTE per Class/ Course (3)	Average Total Cost of Class or Course (4)	Average Class size or Caseload (5)	Average Cost per Pupil (6)	Average Instructional Hours per Year (7)	Average Cost per Pupil-hour, Instruction (8)
Elementary Schools							
Instructional Services							
Regular Teaching Assignment							
Reading	392	0.170	$6,979	21.4	$433	270.7	$2.92
Preschool (ages 3-5)	132	0.484	$20,273	15.7	$1,573	542.3	$4.62
Self-contained: kindergarten	5,889	0.550	$25,026	21.9	$1,250	586.2	$3.05
Self-contained: grade 1-8	43,066	0.653	$30,153	22.6	$1,456	639.1	$3.48
Self-contained: bilingual/multicultural	24	1.000	$58,781	23.7	$2,563	897.6	$2.85
Home instruction	1	0.500	$23,552	1.0	$23,552	1080.0	$21.81
Developmentally handicapped	122	0.154	$6,464	5.1	$926	216.5	$5.44
Gifted/talented (K-12)	12	0.920	$40,313	19.9	$2,061	989.1	$2.80
Specific learning disabled	49	0.290	$13,935	7.7	$1,932	360.9	$8.77
Special Education Teaching Assignment							
Preschool (ages 3-5)	165	0.548	$23,970	8.9	$3,458	655.5	$5.56
Kindergarten	33	0.804	$37,470	7.8	$6,262	812.1	$21.24
Grade 1-8	1,096	0.591	$26,519	8.6	$4,039	626.9	$15.36
Multihandicapped (other than deaf-blind)	495	0.504	$21,813	5.8	$4,075	465.0	$13.06
Severe behavior handicapped	318	0.461	$20,109	5.9	$4,012	462.2	$15.01
Developmentally handicapped	2,012	0.439	$19,270	7.7	$2,965	444.8	$9.40
Gifted/talented (K-12)	117	0.467	$23,849	16.7	$1,655	528.2	$9.71
Specific learning disabled	1,387	0.489	$21,993	7.4	$3,649	514.6	$13.16

continued

Table VI-1. Elementary School FTE Staff Time per Class or Course, Average Class Sizes or Caseloads, and Average Expenditures per Pupil Hour of Instruction for Selected Courses and Classes in Public K-12 Schools in the State of Ohio, 1995-96 (continued)

School Type Position and Assignment of Staff Description of Course or Class Taught (1)	Number of Cases* (2)	FTE per Class/ Course (3)	Average Total Cost of Class or Course (4)	Average Class size or Caseload (5)	Average Cost per Pupil (6)	Average Instructional Hours per Year (7)	Average Cost per Pupil-hour, Instruction (8)
Remedial Specialist							
Remedial reading	44	0.279	$12,996	8.3	$4,258	438.9	$18.35
Kindergarten	72	0.535	$23,684	17.0	$1,487	512.7	$6.59
Grade 1-8	102	0.490	$18,536	19.1	$1,180	466.4	$3.24
Specific learning disabled	11	0.175	$7,710	6.8	$5,829	333.5	$41.58
Teaching Aide Assignment							
Preschool (ages 3-5)	21	0.443	$8,371	25.2	$373	461.4	$0.84
Grade 1-8	2	0.830	22,846	25.0	914	937.5	0.99
Related Services							
Speech and Language Therapist							
Preschool (ages 3-5)	1	1.000	39,326	9.0	4,370	40.0	109.24
Grade 1-8	3	0.833	35,887	41.0	8,135	270.0	19.19
Hearing handicapped	1	0.556	31,870	1.0	31,870	190.0	167.73
Early education of the handicapped	5	0.360	19,212	1.6	17,404	204.0	60.69
Speech handicapped	58	0.501	24,464	18.3	3,735	401.6	20.39

*Number of cases with positive enrollments.

Columns 6 through 8 represent significant linkages in this analysis. Column 6 links staff time and costs to students served. Column 7 links staff time measured in FTEs to instructional hours provided to students. And finally, column 8 brings this all together by linking staff costs and time to students and instructional hours. The

average cost per pupil hour varies across schools and districts based upon the FTE staff time, the relative compensation of various professional staff, the class size enrollment, and the average total number of hours students spend receiving instruction. The actual cost of a given class or course may vary across school systems according to the actual number of hours the course lasts. For example, a year-long course that meets one hour each school day over a 180-day school year requires 180 hours of instructional time. A semester course would require about 90 hours, and so on. A typical self-contained class for an elementary school may meet for 5 hours per day, 180 days per year, and thus requires a total instructional time of 900 hours per year. It is important when viewing these data to recognize that total instructional hours is another dimension of the level of investment in a particular course or subject area.

These course or class level data provide a better sense of the intensity of instructional services provided to different children because of the close linkage observed between staff and students. With these data, one can determine at least the average amounts of time devoted to particular types of instructional services for groups of children. These data also provide some sense of what is happening within the instructional blob. They provide more information on the nature of instructional services being provided to different categories of children.

Table VI-2. High School FTE Staff Time per Class or Course, Average Class Sizes or Caseloads, and Average Expenditures per Pupil Hour of Instruction for Selected Courses and Classes in Public K–12 Schools in the State of Ohio, 1995–96

School Type Position and Assignment of Staff Description of Course or Class Taught	Number of Cases*	FTE Per Class/ Course	Average Total Cost of Class/ Course	Average Class Size Or Caseload	Average Cost Per Pupil	Average Instructional Hours/Year	Average Cost Per Pupil-hour of Instruction
High Schools							
Instructional services							
Regular Teaching Assignment							
Art appreciation	726	0.088	4,603	15.9	840	106.5	7.41
Drawing and painting	1,796	0.090	4,340	13.8	756	115.3	7.28
Photography and film making	524	0.095	5,126	14.6	595	87.3	7.06
Typing	3,013	0.106	5,042	18.1	438	99.4	4.61
Word processing	1,025	0.097	4,621	16.9	428	88.6	4.88
Integrated language arts	14,470	0.157	7,546	21.3	502	134.5	4.26
Remedial reading	442	0.106	4,959	10.1	860	108.1	10.61
Grammar and usage	1,842	0.144	6,527	21.4	394	114.7	4.03
Literature	2,620	0.124	6,167	20.9	402	109.8	4.20
Composition	1,675	0.112	5,257	19.1	396	101.2	4.61
Speech	1,079	0.097	4,677	19.1	351	85.5	4.27
Reading	1,392	0.113	5,150	15.8	533	108.3	5.70
Ap-English	794	0.166	8,959	17.8	609	133.7	5.26
Latin	676	0.129	6,465	15.2	953	139.0	7.30
Spanish	6,730	0.147	6,844	20.3	560	132.2	4.53
Ap-Spanish	106	0.150	8,249	12.2	1,360	141.4	11.83
Physical education	8,270	0.086	4,256	22.6	347	80.6	4.69
General industrial technology	863	0.111	4,869	13.1	747	117.0	6.35
Drafting	1,439	0.103	5,077	11.5	944	120.3	8.13
Woods technology	1,547	0.103	4,961	11.8	831	120.6	7.25
Advanced mathematics	764	0.154	7,643	18.2	621	123.9	5.38
Algebra	7,388	0.153	7,231	21.8	492	131.3	4.18
Pre-algebra	1,239	0.155	6,876	20.9	457	128.7	4.03
Calculus	368	0.161	8,325	14.7	830	128.5	6.73
Remedial mathematics	227	0.115	4,901	12.5	628	100.9	7.19
General science	2,657	0.154	6,681	21.5	435	134.5	3.64
Biological science	5,879	0.164	7,880	21.6	538	138.2	4.47
Physical science	1,670	0.147	6,553	21.6	400	131.4	3.60
Chemistry	3,317	0.172	8,308	19.8	575	143.9	4.37
Physics	1,413	0.171	8,521	17.0	715	138.3	5.74
Government	4,049	0.123	6,061	21.6	426	105.3	4.64

continued

Table VI-2. High School FTE Staff Time per Class or Course, Average Class Sizes or Caseloads, and Average Expenditures per Pupil Hour of Instruction for Selected Courses and Classes in Public K–12 Schools in the State of Ohio, 1995–96 (continued)

School Type Position and Assignment of Staff Description of Course or Class Taught	Number of Cases*	FTE Per Class/ Course	Average Total Cost of Class/ Course	Average Class Size Or Caseload	Average Cost Per Pupil	Average Instructional Hours/Year	Average Cost Per Pupil-hour of Instruction
Geography	1,386	0.121	5,314	22.6	338	106.9	3.50
World history	3,991	0.143	7,015	22.5	479	120.5	4.43
American history	5,471	0.145	7,014	21.9	531	122.8	5.05
Special Education Teaching Assignment							
Typing	14	0.073	3,121	4.8	1,116	122.0	9.80
Integrated language arts	579	0.094	4,085	4.3	1,617	168.0	12.25
Speech	12	0.104	3,722	10.9	646	69.2	9.08
General mathematics	394	0.091	3,782	4.2	1,405	167.1	10.60
General science	196	0.091	3,698	5.4	1,031	195.3	7.49
Government	119	0.078	3,705	3.7	1,753	148.8	16.12
American history	137	0.092	4,202	4.5	1,627	153.2	13.74
Multihandicapped (Other than deaf-blind)	1,219	0.099	4,229	4.0	1,539	136.6	12.53
Severe behavior handicapped	1,576	0.066	2,882	3.1	1,382	121.6	12.32
Specific learning disabled	5,366	0.104	4,833	4.8	1,616	129.7	13.63
Vocational Education Teaching Assignment							
Agriscience	650	0.194	7,957	15.0	626	158.8	4.09
Accounting	95	0.169	8,531	13.3	1,207	155.5	8.71
Typing	548	0.116	5,852	19.6	434	98.4	4.47
Occupational work adjustment	1,060	0.217	11,457	12.8	1,008	207.5	6.10
Auto mechanics	154	0.389	18,326	14.0	1,457	305.2	5.24
Occupational work experience (OWE)	1,120	0.282	15,058	18.2	877	250.0	4.07

For the purpose of this illustration, the classes or courses included in table VI-1 are some of the most common in the Ohio elementary schools. Based on these data,

there are more than 43,000 self-contained grade 1–8 classes taught by regular teachers at a cost of $3.48 per pupil-hour. While the typical self-contained classroom may have a full-time teacher, the Ohio data system tended to break up these general education classes into units that were less than a full day of instruction. This perhaps reflects a mixing of standard elementary school settings, which are more commonly all day classes (perhaps ranging from 5 to 6 hours per day of instructional time), with some more intermediate or middle school grade classes, which may find students attending for approximately two or three periods per day. Indeed, based on the distributions observed in the ODE data, more than half of these classes were taught by a full-time teacher and included anywhere from about 900 to well over 1,300 pupil-hours of class time per year.

Based on these data, the self-contained kindergarten classroom cost about $3.05 per pupil-hour and, on average, required a half-time regular classroom teacher. The preschool classrooms required about the same FTE teacher time but were more costly per hour ($4.62 per pupil hour) because they tended to be smaller on average (fewer than 16 pupils per class).

Among the special education teaching assignments, the self-contained grade 1–8 classes required on average about 0.6 of a FTE teacher, enrolled just under nine students, and exhibited a cost of $15.36 per pupil-hour. Special classes for gifted and talented students cost approximately $9.71 per hour on average and involved a somewhat less than half-time special education teacher (0.47 FTE), and enrolled 16.7 students.

Note that there are some interesting differences in coding patterns in specific classes or courses across districts. For example, while most of the classes for specific learning disabled, gifted/talented, and developmentally handicapped students are coded under special education teaching assignments, some of these types of classes are identified under regular teaching assignments. It is somewhat unclear what this means: that is, are these coding errors, or do they convey accurate information about the types of teachers who actually covered these classes?

Table VI-2 shows a sample of high school delivery systems. These delivery systems generally represent distinct courses being provided in a departmentalized setting within the school. A high school class is commonly taught by a teacher with a full-time course load of about five or six classes. However, the ODE data system permits schools to code classes as all-year, semester, nine-week, six-week, and summer school. This results in considerable variation in the FTE teacher time allocated to these classes. A full-time teaching load of six classes all year is 0.167 of a FTE. If a teacher taught 12 semester classes, the average FTE teacher time would be 0.083. The same class coded on a nine-week basis (approximately one-quarter of the year) would be a 0.042 FTE. Thus, depending on how schools coded course level information, there could be a wide range of variation in the cost of a given course. Again, this provides a rationale for costing these courses out on the basis of per pupil-hour.

These sample classes provide only a portion of the range of classes actually identified in the data provided by ODE. The classes displayed in table VI-2 taught by regular teachers range in cost from $3.50 per pupil hour for geography (average class size of 22.6 pupils) to a high of $11.83 per pupil hour for advanced placement Spanish (average class size of 12.2 pupils). The special education teaching assignments include

a mixture of subject matter classes presumably designed for students with disabilities to special classes. These classes tended to have smaller enrollments which in many instances fall below 10 students, as shown in table VI-2. Vocational classes taught by a vocational teacher (as opposed to a regular teacher) also tend to be relatively smaller in size than the typical high school class. For example, those displayed in table VI-1 range from about 13 students to more than 19, while the typical high school classes displayed in table VI-2 range in the low 20s in enrollment.

Student Profiles: Linking Students to Costs

Tables VI-3 and VI-4 illustrate one of the many ways to use the kind of information presented in tables VI-1 and VI-2 to examine costs of services to students. Tables VI-3 and VI-4 present profiles of the services received by a hypothetical sample of elementary and high school students, respectively. Each table presents four separate student profiles. It also is important to recognize that these expenditures focus on professional staff expenditures and do not include any nonpersonnel resources. To obtain data on nonpersonnel expenditures, data from the accounting model would be required to be combined with these personnel data.[20] Unfortunately, because the data are not organized around the same categories, this kind of analysis would be difficult in the present case.

At the elementary level, table VI-3 shows the instructional services received by a half-day kindergarten student, a regular third grade student who is involved in the instrumental music program, a third grade student with a mild learning disability

[20] For an example in which personnel and nonpersonnel components of expenditure are combined in student profiles, the reader should see Chambers (1994a).

receiving traditional resource services part-time, and a third grade student who is placed in a special class for students classified with specific learning disabilities (SLD). The range of costs for instructional services is from a low of $1,919.32 per pupil for the half-day kindergarten student to a high of $14,216.83 per pupil for the student classified as SLD and placed in a special class. The mild SLD student who spends most of his/her time in the regular self-contained classroom costs about half again as much as the regular third grade student.

Table VI-3. Elementary School Student Profiles Based on Costs per Pupil Hour for Public Schools in the State of Ohio, 1995–96

School Type Position and Assignment of Staff Description of Course or Class Taught	Average Class Size or Caseload	Average Cost per Pupil-hour, Instruction	Sample Student Profiles: Half-day Kindergarten Student		Regular Third Grade Student		Third Grade Student, Mild Specific Learning Disabled		Third Grade Student, Requiring SLD Special Class	
			Hours per Year of Service	Cost per Year of Service	Hours per Year of Service	Cost per Year of Service	Hours per Year of Service	Cost per Year of Service	Hours per Year of Service	Cost per Year of Service
Elementary Schools										
Instructional Services										
Regular Teaching Assignment										
Instrumental Music	45.7	$1.13			36	$40.60				
Self-contained: kindergarten	21.9	3.05	630	1,919.32						
Self-contained: grade 1–8	22.6	3.48			972	3,386.91	900	$3,136.03		
Specific learning disabled	7.7	8.77					180	1,577.93		
Special Education Teaching Assignment										
Grade 1– 8	8.6	15.36								
Specific learning disabled	7.4	13.16							1080	$14,216.83
TOTAL			**630**	**$1,919.32**	**1008**	**$3,427.51**	**1080**	**$4,713.96**	**1080**	**$14,216.83**

Table VI-4. High School Student Profiles Based on Costs per Pupil Hour for Public Schools in the State of Ohio, 1995–96

School Type Position and Assignment of Staff Description of Course or Class Taught	Average Class Size or Caseload	Average Cost Per Pupil-hour of Instruction	Sample Student Profiles: Lower Division High School Student		Upper Division High School Student		Upper Division Vocational Student		Upper Division High School Business	
			Hours per Year of Service	Cost per Year of Service	Hours per Year of Service	Cost per Year of Service	Hours per Year of Service	Cost per Year of Service	Hours per Year of Service	Cost per Year of Service
High Schools										
Instructional services										
Regular Teaching Assignment										
Accounting	13.5	$8.03							180	$1,445.63
Business math	18.2	3.55							180	638.45
Business English	17.6	3.24							180	844.06
Business machines	13.7	6.35							180	1,143.81
Business economics	16.2	4.78							180	860.12
Composition	19.1	4.61					180	830.20		
AP English	17.8	5.26	180	946.61	180	946.61				
Spanish	20.3	4.53	180	814.66						
Physical education	22.6	4.69	180	844.06	180	844.06				
Algebra	21.8	4.18	180	752.29						
Pre-calculus	19.0	5.11			180	919.96				
General mathematics	18.4	4.51					180	812.29		
Computer education	15.5	6.14			180	1,105.20				
Physics	17.0	5.74			180	1,033.78				
Earth science	22.5	3.96	180	712.82						
Government	21.6	4.64			90	417.95			90	417.95
Economics	21.1	4.85			90	436.68			90	436.68
Geography	22.6	3.50	90	315.03			90	315.03		
Current events/issues	19.3	4.67	90	419.88			90	419.88		
Vocational Education Teaching Assignment										
Auto Mechanics	14.0	5.24					540	2,827.77		
TOTAL			**1080**	**4,805.34**	**1080**	**5,704.24**	**1080**	**$5,205.16**	**1080**	**$5,786.70**

At the high school level, table VI-4 shows the instructional services and costs associated with a regular lower division (grades 9 and 10) high school student, an upper division regular high school student, an upper division vocational student, and an upper division high school business student. The lower division regular high school student is taking five all-year classes (1 hour per day for 180 days per year) including AP-English, Spanish, physical education, algebra, and earth science, and he/she is taking two one-semester classes (1 hour per day for 90 days each) which are geography and current events/issues. Total cost of instructional services is $4,805.34 per pupil. The upper division high school student costs almost 18 percent more at $5,704.24 compared to $4,805.34 for the lower division student, mostly because some high level courses like physics and computer science are taught in smaller classes (well below 20 students, on average). Costs for the upper division vocational student fall in between these two at $5,205.16. Notice that the vocational student specializing in auto mechanics is taking a course which runs 3 hours per day all year (i.e., half of his/her full instructional program). It is important to keep in mind that only the personnel costs are included here as it is likely that some of the high level science classes and the specialized vocational classes will generally require substantial investments in furnishings, lab or shop facilities, and equipment which are not reflected in these cost differences. Finally, the upper division business student costs approximately the same as the regular upper division high school student because the class sizes again tend to be somewhat smaller for the specialized business classes than the regular classes taken by the lower division high school student.

Allocations of Total Instructional Expenditures

Tables VI-5 and VI-6 organize the staff and course level data in a slightly different way to illustrate yet another approach to breaking out the instructional blob. These tables focus on elementary and high schools only for the purposes of illustration. Column 1 reports the cluster of courses listed by staff position-assignment (e.g., regular teaching assignment or special education teaching assignment) and by school type (i.e., elementary in table VI-5 and high school in table VI-6). Rather than presenting a detailed listing of all courses, the table aggregates total instructional expenditures into clusters of classes or courses. These clusters are, to a large degree, organized around major subject areas or categories of service delivery systems such as self-contained classes where multiple subjects areas are covered.

Column 2 reports the total instructional expenditures on classes or courses within each cluster listed in column 1. These expenditures include the sums of all staff expenditures involved in provision of each cluster of courses within the designated staff position assignments delineated in the table (e.g., regular teaching assignment).

Column 3 reports the percentage of total instructional personnel expenditures for elementary and high schools, respectively in each table, allocated to the corresponding cluster of classes or courses listed in column 1. For example, in table VI-5, the grand total of instructional personnel expenditures amounts to about $1.648 billion, and the instructional personnel expenditures for regular teaching assignments/self-contained grades 1–8 amount to $1.299 billion. Thus, about 79 percent (= 100 ×1.299/1.648) of these expenditures are accounted for by self-contained grades 1–8 classes.

Table VI-5. Total School Expenditures on Direct Instructional Services, Total Numbers of Students Served, Average Cost per Child Served, and Percent of Total State Enrollment in Public Elementary Schools in the State of Ohio, 1995–96

School Type Position and Assignment of Staff Description of Subject Area (1)	Total Instructional Expenditures on Classes or Courses (2)	Percent of Total Elementary Instructional Expenditures (3)	Total Students Served (4)	Percent of Total State Enrollment Served (5)	Average Cost per Child Served (6)
Elementary Schools					
Instructional Services					
Regular Teaching Assignment					
Art Education					
Self-contained: bilingual/multicultural	$1,410,750	0.09%	568	0.03%	$2,484
Self-contained: grade 1–8	1,298,583,343	78.81	974,295	55.34	1,333
Kindergarten	147,377,037	8.94	128,783	7.32	1,144
Preschool (ages 3–5)	2,676,033	0.16	2,076	0.12	1,289
Special education for handicapped pupils	2,450,183	0.15	1,432	0.08	1,711
All other regular classes and courses	23,500,471	1.43	83,715	4.76	281
Special Education Teaching Assignment					
All courses	1,306,373	0.08	1,408	0.08	928
Grade 1–8	29,065,196	1.76	9,376	0.53	3,100
Health and Physical Education					
Kindergarten	1,236,518	0.08	256	0.01	4,830.15
Mathematics Education					
Preschool (ages 3–5)	3,955,048	0.24	1,471	0.08	2,688.68
Science Education					
Social Science/Studies Education					
Special education for handicapped pupils	102,638,240	6.23	36,043	2.05	36,043
Vocational Education Teaching Assignment					
All courses	434,507	0.03	1,022	0.06	425
Educational Services Teacher					
All courses	21,313,054	1.29	133,211	7.57	160

continued

Table VI-5. Total School Expenditures on Direct Instructional Services, Total Numbers of Students Served, Average Cost per Child Served, and Percent of Total State Enrollment in Public Elementary Schools in the State of Ohio, 1995–96 (continued)

School Type Position and Assignment of Staff Description of Subject Area (1)	Total Instructional Expenditures on Classes or Courses (2)	Percent of Total Elementary Instructional Expenditures (3)	Total Students Served (4)	Percent of Total State Enrollment Served (5)	Average Cost per Child Served (6)
Special Education Supplemental Services Teacher					
Special education for handicapped pupils	58,933	0.00	23	0.00	2,562
Remedial Specialist					
All courses	4,678,662	0.28	3,969	0.23	1,179
Tutor/Small Group Instructor					
All courses	$1,177,724	0.07%	1,079	0.06%	$1,091
Special education for handicapped pupils	1,476,065	0.09	502	0.03	2,940
Teaching Aide Assignment					
Grade 1–8	45,691	0.00	50	0.00	914
Preschool (ages 3–5)	175,783	0.01	529	0.03	332
Other education support services	646,556	0.04	1,132	0.06	571
Related Services					
Speech and Language Therapist					
Grade 1–8	107,662	0.01	123	0.01	875
Preschool (ages 3–5)	39,326	0.00	9	0.00	4,370
Special education for handicapped pupils	1,546,827	0.09	1,068	0.06	1,448
Other Professional Support					
Other professional assignment	379,414	0.02	289	0.02	1,313
Technical assignment	39,056	0.00	332	0.02	118
Extracurricular/intracurricular activities	65,370	0.00	2,779	0.16	24
Administrative & general	1,305,640	0.08	1,088	0.06	1,200

Column 4 aggregates total numbers of students served across all of the courses or classes within any given cluster. These counts of students reflect duplicated counts of students in some cases. That is, a student who has been assigned to more than a single class or course included within a cluster would be counted once for each class or course in which he/she was enrolled. In some cases, there is likely no double counting since the courses represent either mutually exclusive categories of student class assignments.

Column 5 reports the percentage of total state enrollment (i.e., 1,760,469 students) reported in the Ohio public school districts included in this analysis. This is not limited to those enrolled in just the elementary schools, but rather represents the total of students at all levels and in all types of schools in the Ohio public school districts included in the files used for this analysis.

Column 6 reports the average instructional personnel expenditure per pupil for each course or cluster. It is important to recognize that these numbers provide overall averages across multiple service delivery systems and reflect the duplicated counts of students. Thus, these numbers do reflect an average cost per pupil for these delivery systems. While they provide a useful overview of expenditures and allocation, one must recognize that hidden within these averages are substantial variations in the way courses and classes are taught across schools and districts. Specifically, these numbers hide substantial variations in class sizes and the hours of instructional time to which students are exposed.

It is not surprising that table VI-5 shows a substantial portion of instructional expenditures allocated to regular self-contained classrooms (i.e., 78.81 percent) and

these classes enroll more than half of all students in the state. Kindergarten classes account for another 8.94 percent of total elementary instruction and they enroll 7.32 percent of the total enrollment in the state. Adding up all of the special education components indicates that approximately 8.72 percent of elementary school instructional personnel expenditures are accounted for by services for students with disabilities. [21]

The major components of instructional personnel expenditure are the high school level include courses in English (15.82 percent), foreign languages (7.36 percent), health and physical education (4.97 percent), mathematics education (13.70 percent), science education (12.13 percent), and social science education (11.24 percent). Other somewhat less important categories of instructional expenditure include art education (2.91 percent), industrial technology education (2.79 percent), and music education (2.02 percent). Special education accounts for 7.42 percent at the high school level and the remaining courses account for a total of 19.64 percent of total expenditures. [22]

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[21] The total special education percentage is determined as the sum of all of the Special education teaching assignments (8.39 percent) plus Special education for handicapped pupils listed under Regular teaching assignment (0.15 percent), Tutor/small group instructor (0.09 percent), and Speech and language therapist (0.09 percent) for a total of 8.72 percent.

[22]The total special education percentage is determined as the sum of all of the Special education teaching assignments (5.99 + 1.02); plus the special education for handicapped pupils listed under Remedial specialist (0.01 percent), Tutor/small group instructor (0.17 percent), and Speech and language therapist (0.01 percent); and plus the Special education supplemental services teacher (0.01) for a total of 7.21 percent. The 21.87 percent is the residual of 100.0 less 15.82, 7.36, 4.97, 13.7, 12.13, 11.24, 2.91, 2.79 and 7.21 — numbers all referred to in the paragraph.

Table VI-6. Total School Expenditures on Direct Instructional Services, Total Numbers of Students Served, Average Cost per Child Served, and Percent of Total State Enrollment in Public High Schools in the State of Ohio, 1995–96

School Type Position and Assignment of Staff Description of Subject Area	Total Instructional Expenditures on Classes or Courses	Percent of Total High School Instructional Expenditures	Total Students Served	Percent of Total State Enrollment Served	Average Cost per Child Served
High Schools					
Instructional services					
Regular Teaching Assignment					
Art education	$33,869,367	2.91%	108,183	6.15%	$313
Business education	38,608,773	3.32	121,534	6.90	318
English education	184,058,945	15.82	538,048	30.56	342
				0.10	
Family and Consumer Sciences Education					
Foreign language education	85,597,875	7.36	224,858	12.77	381
Health and physical education	57,768,284	4.97	297,691	16.91	194
Industrial technology education	32,469,613	2.79	81,238	4.61	400
Mathematics education	159,438,646	13.70	456,009	25.90	350
Science education	141,082,377	12.13	384,107	21.82	367
Social science/studies education	130,740,463	11.24	444,746	25.26	294
All other courses	42,327,094	3.64	167,383	9.51	253
Special Education Teaching Assignment					
Special education for handicapped pupils	69,650,880	5.99	80,211	4.56	868
Trade and industrial education					
All other courses	11,847,941	1.02	15,306	0.87	774
Vocational Education Teaching Assignment					
Family and consumer sciences education	39,150,760	3.36	114,734	6.52	341
Trade and industrial education	33,954,157	2.92	34,190	1.94	993
All other courses	69,273,087	5.95	105,227	5.98	658
Educational Services Teacher					
All other courses	12,378,859	1.06	57,141	3.25	217
Special Education Supplemental Services Teacher	95,668	0.01	50	0.00	1,913

continued

Table VI-6. Total School Expenditures on Direct Instructional Services, Total Numbers of Students Served, Average Cost per Child Served, and Percent of Total State Enrollment in Public High Schools in the State of Ohio, 1995–96 (continued)

School Type Position and Assignment of Staff Description of Subject Area	Total Instructional Expenditures on Classes or Courses	Percent of Total High Instructional Expenditures	Total Students Served	Percent of Total State Enrollment Served	Average Cost per Child Served
Remedial Specialist					
Special education for handicapped pupils	$65,046	0.01%	66	0.00%	$986
All other courses	3,745,889	0.32	7,281	0.41	514
Tutor/Small Group Instructor					
Special education for handicapped pupils	1,926,911	0.17	1,546	0.09	1,246
All other courses	591,754	0.05	1,104	0.06	536
Teaching Aide Assignment					
Foreign language education	26,063	0.00	24	0.00	1,086
Other education support services	165,790	0.01	750	0.04	221
Curriculum Specialist					
Counseling assignment	2,542,205	0.22	2,678	0.15	949
Librarian/media	1,884,864	0.16	1,090	0.06	1,729
Audio-visual	221,478	0.02	155	0.01	1,429
Other vocational personnel	2,416,199	0.21	4,168	0.24	580
Other professional — educational	2,523,592	0.22	4,560	0.26	553
Related Services (possible Pull-out)					
Speech and Language Therapist					
Special education for handicapped pupils	72,067	0.01	29	0.00	2,485
	132,395	0.01	209	0.01	633
Other Professional Support					
Technical Assignment	45,794	0.00	79	0.00	580
Extracurricular/Intracurricular Activities	294,117	0.03	14,153	0.80	21
Administrative & General	4,532,221	0.39	3,618	0.21	1,253
TOTAL	**$1,163,499,173**				

It also is of interest to note the percentage of total students enrolled in these courses. Remember that to some degree these numbers could reflect double counting of students. However, this would only be the case to the extent that students are taking multiple courses at any given time within a subject area. It also is useful to remember in looking at the enrollment data that these percentages are taken as a percentage of all students in the state. High schools perhaps enroll only about one-third (33 percent) of the students in the state. With this in mind, the figures reporting percentages of total students enrolled in each of the major high school courses include substantial percentages of high school students: that is, English enrolls 30.56 percent of all students, foreign languages enrolls 12.77 percent, health and physical education enrolls 16.91 percent, mathematics education enrolls 25.90 percent, science education enrolls 21.82 percent, and social science education enrolls 25.26 percent.

Concluding Remarks

This chapter took a major step toward translating the personnel database from ODE into an RCM type of database. Specifically, the ODE staffing database was linked to the course level and student level files. The course level files designated which staff members were involved in providing which instructional services. We then merged the staffing information with data about these individual courses including instructional hours and the classroom in which they were offered. The classroom locations permitted this file to be linked with an aggregated student level file containing total enrollments by class or course. The merging of these various databases resulted in the linking of staff FTEs and costs to instructional hours and students served.

These data on course and class costs can then be organized into profiles of services and costs received by certain student populations. In our examples, the profiles represented only hypothetical student schedules, since actual student schedules are not readily available without substantial permission from individual districts and schools within Ohio. However, actual student profiles could, theoretically, be organized from data that do exist in the regional data centers within the state.

Linking these kinds of student service profiles with student outcomes over time may provide valuable information about the effectiveness of certain types and configurations of resources with regard to student performance. Moreover, these kinds of data would be a valuable resource informing discussion of the adequacy of school resources and the equity with which these resources are distributed across certain student populations.

VII. Conclusion and Next Steps

Introduction

The purpose of this report has been to describe some alternative approaches for measuring resources in K–12 education. Chapter II presented a conceptual comparison of the perspectives of the accountant and the economist in the endeavor to measure resources in education. The approaches of these two disciplines differ in some important respects from one another largely because of the goals each is trying to achieve in organizing resource data. Accountants strive for comparability in reporting, while economists strive for explaining behavior and understanding productivity. These two different goals result in somewhat different emphasis in the way data need to be organized. Accounting data rely on structures for coding expenditure information according to the objects of expenditure like salaries and supplies, functions such as instruction and administration, programs such as regular and special education, and funds which identify flows of revenue (e.g., state and local general aid versus categorical programs like Title I). The Coopers-Lybrand Finance Analysis Model (FAM) briefly described in Chapter II represents a good example of the accountant's approach.

While these types of categories are not at all foreign to the economist, there are other dimensions that become important when trying to explain behavior. It is important to break expenditure up into its component parts: prices, quantities, and characteristics (or qualifications of personnel, if you will). The Resource Cost Model

(RCM) described in Chapter II represents a good example of the economists' perspective in organizing data. The RCM is an ingredients-based approach which builds expenditure estimates from the bottom up, and organizes resource information around the structures of service delivery.

Chapter III provided an empirical illustration of the kinds of data that typically are found in accounting databases. This empirical analysis relies exclusively on fiscal data graciously provided by the Ohio Department of Education. Specifically, fiscal files with detailed expenditure records are used in developing the tables of accounting data. The tables presented in Chapter III illustrate the kinds of information and issues that can be addressed using accounting data.

Accounting models strive to achieve compatibility in the way information is reported across local jurisdictions and to permit access to school level expenditure information. While these models have made some significant strides and contributions to improving comparative expenditure analysis, they are not currently structured for cost analysis per se. The reason is that accounting models focus on dollars rather than the physical ingredients underlying the dollars. The accounting models are valuable for addressing *what is* kinds of questions, but may be less well suited to *addressing what ought to be* kinds of questions. For example, the Ohio accounting model breaks out in considerable detail the administrative blob in education to explain where noninstructional expenditures go. However, in its place, this accounting model creates an instructional blob that does not provide much information on how educational services are being delivered to children. To some extent, this is nothing more than a coding issue. That is, if you code the data correctly, same result is achieved with either the accounting or RCM approach. But the reason for these differences arises out of

differences in the purposes for which the two models are developed. This issue is discussed more extensively in the next section below.

In contrast to the accounting models such as FAM, the RCM was originally designed to address *what if* or *what ought to be* kinds of questions. It is more of a cost model in that it is ingredients- or resource-based. The RCM builds cost analysis from the bottom up: resources are combined into service delivery systems to form the basis for cost projections or estimates. Only after initial use as a cost projection model was the RCM used for expenditure or *what is* types of analyses. The value of the RCM is perceived to be its organization around the service delivery system as the primary unit of analysis. In fact, the use of the service delivery system as the primary unit of analysis is a major feature that distinguishes the RCM from the FAM. The service delivery system is a representation or model of the way in which educational services are delivered to the child. It is more than just a way of organizing information. The service delivery system is a reflection of the way resources are organized for production, and for this reason, it creates a useful foundation for the analysis of educational productivity, student need, and the adequacy and equity in school funding.

Chapter IV used the ODE personnel database to illustrate an alternative to the accounting approach to organize personnel data. First, this chapter began to break down the information on instruction somewhat and provided a very different perspective on administration by focusing attention on the position and job assignments held by individuals rather than on the function per se. Second, this chapter presented data in terms of quantities of personnel time measured in two complementary dimensions: full-time equivalents (FTEs) and numbers of stipends.

Chapter V developed a series of indexes to show how breaking expenditures into its components of prices, quantities and qualifications could provide some insights into the patterns of variation across certain categories of districts.

Finally, Chapter VI linked the basic staff data with information about courses taught by individuals and student enrollments by course. This permitted the expenditure data to link staff time with instructional time and with students served. These data were used to create some hypothetical student profiles to illustrate what kinds of detail might be possible for understanding the collections of resources to which students are exposed that might impact their performance.

What Really Differentiates the Accounting Model from the RCM?

Are accounting models capable of the types of detail presented in the RCM database? The answer is a qualified *yes*. To some degree, the difference between the accounting and RCM approach lies in the coding structures. Accounting models are designed around a set of object, function, program, and fund codes, and they focus attention on dollars to measure resources. Translation of accounting models into an RCM-style database requires two modifications. First, one needs to add a code for service delivery. The RCM organizes information on resources into types of services being delivered to children: that is, self-contained classrooms, resource programs, departmentalized instruction by subject area, library services, and administrative services. The service delivery system combines information on the combinations of personnel and nonpersonnel resources with information on the numbers and types of students served.

Second, the RCM emphasizes measuring resources to the extent possible in the raw, physical units. That is, resources are measured in terms of quantities, hours of work, or full-time-equivalencies whenever possible. Moreover, inputs are classified or categorized in terms of their characteristics. For example, personnel inputs would be classified according to personal qualifications or other attributes that may affect how personnel are used.

Accounting models could be made consistent with the RCM approach if they were linked more systematically to personnel data systems like the one in Ohio. However, one of the difficulties in linking accounting and personnel data is that each o f these databases are often based on separate kinds of data collections. The accounting data are commonly gathered after the fact: that is, they represent a description of spending that has occurred over a specific interval of time (i.e., a fiscal year). The personnel data generally represent a snapshot of the system at a point in time. The personnel data generally can be made available sooner than the accounting data and can be used to estimate what the expected costs, while the accounting data generally will be more accurate because they are a reflection of actual costs.

Nevertheless, the accounting and RCM approaches could be merged by using the ODE personnel coding system to track personnel allocations over time. The difficulty is that this kind of personnel tracking is tedious and requires a great deal of effort on the part of school personnel who are responsible for the management information systems. With this in mind, the accounting systems may be destined to collect data at a higher level of aggregation in order to provide an accurate accounting of all resources that have been expended. The RCM approach, which relies on a much more detailed level

of data collection, may be best used for cost analyses where current data are at a premium and the data collection can be based on a point in time.

The importance of organizing resources in terms of service delivery units and measurement of physical ingredients is that it is ultimately these physical units and the ways they are combined that would likely impact outcomes. A major value of reporting data on resources is to provide information to policymakers that can be used to evaluate accountability and productivity within the enterprise: public education in this case. Thus, it is important that resource levels be measured in terms that have the potential for increasing knowledge of what works and what does not.

Clearly, resource measurement as presented in this report is only part of the picture. A full picture will require information on the instructional processes and the applications of the curriculum that are used within the observed configurations of educational resources. Moreover, to complete the picture, one must be able to measure the standards of outcomes and the incentive structures that individuals have to achieve the standards. That is, it is necessary to understand the choices of students, teachers, and school and district decisionmakers to understand and explain the factors that underlie variations in productivity in education.

Future Research

Future work on the analysis of educational costs and expenditures must build on the advantages of all of the existing methodologies being employed for this purpose. The accounting models, and FAM in particular, strive for compatibility across jurisdictions by establishing a structured and rigid framework for organizing educational

expenditure data. Indeed, to maintain its spirit, it must reflect the existing way in which educational services are actually being delivered to children. The RCM is designed to accommodate change, and therefore, is not rigidly defined. Nevertheless, the building blocks of the RCM are all elements that are intended to be commonly understood by educational professionals: that is, the resources, ingredients, and service delivery systems which form the foundation of the RCM must reflect the common understanding and perception of the service providers themselves.

Will FAM provide useful data for analysis of adequacy, equity, and productivity in education, and will it serve to improve the information currently available to policymakers? The answer is *yes* on two counts. First, FAM establishes a structure to achieve data compatibility. Second, it organizes information into useful categories for understanding certain facets of the patterns of variation in educational expenditure.

However, FAM will fall short in helping policymakers determine what it is that is associated with more productive schools. Because the FAM creates an instructional blob, it may not be possible to ascertain what specific investments in educational services are more effective than others. One ends up asking the same questions that have been asked for years. Which kinds of resources are most effective? In what ways should they be combined to be most effective? That is, what kinds of specific services are most effective and with what intensity should they be provided to children?

There is a major flaw in the application of FAM. That is, if its underlying accounting systems are not sufficiently detailed, the resulting information derived from the application of the FAM will be faulty. FAM is heavily reliant on the level of detail available from the original accounting systems to which it is applied and on the

decision rules established for attributing expenditure information to a program or school. Thus, although the FAM structure itself represents a useful delineation of school spending, it only is as good as the basic accounting data and system from which the numbers are derived. If each of the states maintains its own accounting system, there will still be potential incompatibilities in the data across states even if the information is filtered through FAM. Adequate implementation would require application of FAM to all school districts in all states to ensure full compatibility. Obtaining the agreement of fifty states on the establishment of a single accounting structure, much less the implementation of a single methodology for secondary analysis of data such as those provided by FAM, does not seem likely.

Clearly, much more extensive analysis could be done with tables such as the ones presented in this report. The discussion above has only scratched the surface in using the accounting or RCM type or data. The purpose of this presentation has not been to exhaust all of the possible analyses. Rather, the purpose was to illustrate some ways of using accounting and personnel data for the purpose of measuring the patterns of resource allocation in schools.

There are a number of specific areas in which future analyses could be conducted. These include:

- *Integration of accounting and personnel data.* Next steps might include exploration of how the accounting and personnel databases could be used in conjunction with one another to ascertain how much is spent on nonpersonnel items in each of the relevant program or student categories. Nonpersonnel expenditures will generally be important for the analysis of resources allocated to certain specific categories of students with special

needs or taking certain kinds of programs such as vocational education. Accounting data may also provide some perspectives on how personnel data might be organized into functional categories for further analysis of the composition of instruction, support, operations, and administrative expenditures and resources.

- *Adequacy and equity analysis.* Moreover, much fruitful analysis could be done regarding equity of the distributions of the expenditures or resources across districts serving various student populations. It would be interesting to apply the indexes of the quantity and qualifications of personnel as done in tables V-1 and V-2 to the data on total instructional personnel expenditure displayed in tables VI-5 and 6. Equity analysis could take the form of looking at the distribution of quantities and qualifications of staff. Also, as a starting point for exploring issues related to adequacy, it would be useful to examine actual service profiles for students to measure the current levels of expenditures allocated to serving students with varying educational needs, as was done in tables VI-3 and VI-4 for particular elementary and high school students.

- *Analysis of productivity.* Finally, these various analyses of expenditures and resources could be used in conjunction with student outcome data to ascertain whether there are any specific patterns of variation in resource allocation associated with better results for students. One could use the techniques for developing the personnel quantity and quality indexes in tables VI-3 and VI-4 to explore the relationships between resource inputs and student outcomes at the school and district level.

Concluding Remarks

There has been a long standing separation between fiscal considerations and the assessment of student outcomes in education. Educational research, reform, and practice deal with these two realms as though they function in separate domains. Fiscal experts, accountants, and economists focus attention on the conduct of cost analysis of educational programs, while curricular or programmatic experts, psychologists, and educational professionals explore issues related to the evaluation and assessment of student achievement or outcomes.

To some degree, this division reflects a natural outgrowth of professional background and training. Analysis of fiscal, curricular, or student assessment data requires different disciplinary methodologies and skills and a different programmatic knowledge base. Thus, there is the natural inclination to analyze fiscal, curricular, and assessment issues independently.

However, heightened concern over accountability and school effectiveness has increased the importance of establishing linkages among these strands of research and analysis. While, in some instances, the continued separation of fiscal and assessment research may be appropriate, it is becoming increasingly apparent that major strides in understanding productivity will only occur when this linkage is successfully made. Given limited resources and the importance of education program decisions, policymakers need to have program and outcome data in an understandable format so they can make informed decisions in allocating resources to programs and services.

This report suggests techniques for developing better resource measures. To take the next steps, the analysis presented in this report needs to be combined with measures of curricular materials and processes and with appropriate measures of the diverse outcomes of the schooling process. For sound decisions to be made about the optimal mix of programs and services, the fiscal, curricular, and assessment policy components must come together.

Appendix A. Problems Encountered in Creating the Accounting and Personnel Databases

All was not smooth in development of the accounting and personnel databases for this project. Indeed, part of the story told by this report relates to the nature of some of these problems and the implications for using state data systems for analysis of resource allocation. First, it should be recognized that Ohio maintains one of the better quality education management information systems in the country. The Ohio accounting and personnel data provide the opportunity for districts to report valuable information on the patterns of resource allocation in K–12 education. However, one of the problems encountered in this project arose from the inconsistent use of various accounting codes across the districts and schools. In the fiscal database provided by ODE, only about 11 percent of the records in the file contained valid job assignment codes. Based on object-of-expenditure information, it was possible to ascertain whether salaries were paid to certified or noncertified personnel, but there was no way to ascertain what kinds of personnel (i.e., job assignment codes) were involved in the delivery of services.

Second, as described in Chapter III, there appears to be an inconsistency in the way individual districts report personnel benefits. The benefit rates determined from the school level data appear to be lower than expected (i.e., below 20 percent for certified personnel and around 25 percent for noncertified personnel), while the benefit rates

reported at the central district office were extraordinarily high (well above 100 percent in some cases). Thus, it appears that at least some portion of benefits or some districts report a portion of the benefit contributions on behalf of employees at the district level. This makes it difficult to track total compensation costs to the various kinds of services provided by school and district employees.

Third, significant problems were related to the reliability and validity of the data: there were some invalid account codes reported in accounting and personnel records; observations were encountered that should not have been included in staff files (e.g., from previous years); some data with values for FTEs, hourly wages, or hours and days of work appeared to be out of normal range;[23] observations did not properly match across personnel and student course files; and documentation did not match the reality of the data systems. There currently is no way to determine whether these problems were the result of processing difficulties encountered by ODE or our misunderstanding of the documentation. Indeed, there were cases where satisfactory answers for some of the observed problems could not be obtained from the many helpful staff in the ODE. In other instances, we were able to resolve initial problems given the assistance of the ODE staff.

This is not to say that the data were not in fairly good shape, generally, or that these problems prevented the development of valuable databases for the purpose of analyzing patterns of resource allocation. However, substantial resources were required to identify these problems and arrive at solutions on how to process the information.

[23] The analysis in this report requires calculation of consistent values for FTEs, hourly wages, hours and days of work. Unfortunately, there literally were a few thousand observations for which FTEs for positions were substantially greater than 1.0 (e.g., in the range of 1.5 to 3.0 for a single individual), hourly wages were below $4.00, days of work were greater than 260 (in some cases greater than 300), and hours of work were greater than eight or even 10 hours per day.

Moreover, in some instances, it was not possible to resolve all of the problems satisfactorily. It must be admitted that putting together a comprehensive RCM type database is a tedious and very time intensive process.

Given the quality and comprehensiveness of the ODE database used for this project and the level of difficulty encountered in generating the analysis databases, one can only imagine how difficult it would be to pull such comparisons or analyses together from states that have less comprehensive data systems. Moreover, the compatibility problems across states could be potentially significant. That is, one would have to develop a series of cross walks to a single system for coding and organizing fiscal and personnel data. This invariably involves aggregating data in ways that will accomodate the state with the least detailed data system.

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Listing of NCES Working Papers to Date

Please contact Angela Miles at (202) 219-1761 (angela_miles@ed.gov)
if you are interested in any of the following papers

Number	Title	Contact
94-01 (July)	Schools and Staffing Survey (SASS) Papers Presented at Meetings of the American Statistical Association	Dan Kasprzyk
94-02 (July)	Generalized Variance Estimate for Schools and Staffing Survey (SASS)	Dan Kasprzyk
94-03 (July)	1991 Schools and Staffing Survey (SASS) Reinterview Response Variance Report	Dan Kasprzyk
94-04 (July)	The Accuracy of Teachers' Self-reports on their Postsecondary Education: Teacher Transcript Study, Schools and Staffing Survey	Dan Kasprzyk
94-05 (July)	Cost-of-Education Differentials Across the States	William Fowler
94-06 (July)	Six Papers on Teachers from the 1990-91 Schools and Staffing Survey and Other Related Surveys	Dan Kasprzyk
94-07 (Nov.)	Data Comparability and Public Policy: New Interest in Public Library Data Papers Presented at Meetings of the American Statistical Association	Carrol Kindel
95-01 (Jan.)	Schools and Staffing Survey: 1994 Papers Presented at the 1994 Meeting of the American Statistical Association	Dan Kasprzyk
95-02 (Jan.)	QED Estimates of the 1990-91 Schools and Staffing Survey: Deriving and Comparing QED School Estimates with CCD Estimates	Dan Kasprzyk
95-03 (Jan.)	Schools and Staffing Survey: 1990-91 SASS Cross-Questionnaire Analysis	Dan Kasprzyk
95-04 (Jan.)	National Education Longitudinal Study of 1988: Second Follow-up Questionnaire Content Areas and Research Issues	Jeffrey Owings
95-05 (Jan.)	National Education Longitudinal Study of 1988: Conducting Trend Analyses of NLS-72, HS&B, and NELS:88 Seniors	Jeffrey Owings

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95-06 (Jan.)	National Education Longitudinal Study of 1988: Conducting Cross-Cohort Comparisons Using HS&B, NAEP, and NELS:88 Academic Transcript Data	Jeffrey Owings
95-07 (Jan.)	National Education Longitudinal Study of 1988: Conducting Trend Analyses HS&B and NELS:88 Sophomore Cohort Dropouts	Jeffrey Owings
95-08 (Feb.)	CCD Adjustment to the 1990-91 SASS: A Comparison of Estimates	Dan Kasprzyk
95-09 (Feb.)	The Results of the 1993 Teacher List Validation Study (TLVS)	Dan Kasprzyk
95-10 (Feb.)	The Results of the 1991-92 Teacher Follow-up Survey (TFS) Reinterview and Extensive Reconciliation	Dan Kasprzyk
95-11 (Mar.)	Measuring Instruction, Curriculum Content, and Instructional Resources: The Status of Recent Work	Sharon Bobbitt & John Ralph
95-12 (Mar.)	Rural Education Data User's Guide	Samuel Peng
95-13 (Mar.)	Assessing Students with Disabilities and Limited English Proficiency	James Houser
95-14 (Mar.)	Empirical Evaluation of Social, Psychological, & Educational Construct Variables Used in NCES Surveys	Samuel Peng
95-15 (Apr.)	Classroom Instructional Processes: A Review of Existing Measurement Approaches and Their Applicability for the Teacher Follow-up Survey	Sharon Bobbitt
95-16 (Apr.)	Intersurvey Consistency in NCES Private School Surveys	Steven Kaufman
95-17 (May)	Estimates of Expenditures for Private K-12 Schools	Stephen Broughman
95-18 (Nov.)	An Agenda for Research on Teachers and Schools: Revisiting NCES' Schools and Staffing Survey	Dan Kasprzyk
96-01 (Jan.)	Methodological Issues in the Study of Teachers' Careers: Critical Features of a Truly Longitudinal Study	Dan Kasprzyk

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Number	Title	Contact
96-02 (Feb.)	Schools and Staffing Survey (SASS): 1995 Selected papers presented at the 1995 Meeting of the American Statistical Association	Dan Kasprzyk
96-03 (Feb.)	National Education Longitudinal Study of 1988 (NELS:88) Research Framework and Issues	Jeffrey Owings
96-04 (Feb.)	Census Mapping Project/School District Data Book	Tai Phan
96-05 (Feb.)	Cognitive Research on the Teacher Listing Form for the Schools and Staffing Survey	Dan Kasprzyk
96-06 (Mar.)	The Schools and Staffing Survey (SASS) for 1998-99: Design Recommendations to Inform Broad Education Policy	Dan Kasprzyk
96-07 (Mar.)	Should SASS Measure Instructional Processes and Teacher Effectiveness?	Dan Kasprzyk
96-08 (Apr.)	How Accurate are Teacher Judgments of Students' Academic Performance?	Jerry West
96-09 (Apr.)	Making Data Relevant for Policy Discussions: Redesigning the School Administrator Questionnaire for the 1998-99 SASS	Dan Kasprzyk
96-10 (Apr.)	1998-99 Schools and Staffing Survey: Issues Related to Survey Depth	Dan Kasprzyk
96-11 (June)	Towards an Organizational Database on America's Schools: A Proposal for the Future of SASS, with comments on School Reform, Governance, and Finance	Dan Kasprzyk
96-12 (June)	Predictors of Retention, Transfer, and Attrition of Special and General Education Teachers: Data from the 1989 Teacher Followup Survey	Dan Kasprzyk
96-13 (June)	Estimation of Response Bias in the NHES:95 Adult Education Survey	Steven Kaufman
96-14 (June)	The 1995 National Household Education Survey: Reinterview Results for the Adult Education Component	Steven Kaufman

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96-15 (June)	Nested Structures: District-Level Data in the Schools and Staffing Survey	Dan Kasprzyk
96-16 (June)	Strategies for Collecting Finance Data from Private Schools	Stephen Broughman
96-17 (July)	National Postsecondary Student Aid Study: 1996 Field Test Methodology Report	Andrew G. Malizio
96-18 (Aug.)	Assessment of Social Competence, Adaptive Behaviors, and Approaches to Learning with Young Children	Jerry West
96-19 (Oct.)	Assessment and Analysis of School-Level Expenditures	William Fowler
96-20 (Oct.)	1991 National Household Education Survey (NHES:91) Questionnaires: Screener, Early Childhood Education, and Adult Education	Kathryn Chandler
96-21 (Oct.)	1993 National Household Education Survey (NHES:93) Questionnaires: Screener, School Readiness, and School Safety and Discipline	Kathryn Chandler
96-22 (Oct.)	1995 National Household Education Survey (NHES:95) Questionnaires: Screener, Early Childhood Program Participation, and Adult Education	Kathryn Chandler
96-23 (Oct.)	Linking Student Data to SASS: Why, When, How	Dan Kasprzyk
96-24 (Oct.)	National Assessments of Teacher Quality	Dan Kasprzyk
96-25 (Oct.)	Measures of Inservice Professional Development: Suggested Items for the 1998-1999 Schools and Staffing Survey	Dan Kasprzyk
96-26 (Nov.)	Improving the Coverage of Private Elementary-Secondary Schools	Steven Kaufman
96-27 (Nov.)	Intersurvey Consistency in NCES Private School Surveys for 1993-94	Steven Kaufman

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96-29 (Nov.)	Undercoverage Bias in Estimates of Characteristics of Adults and 0- to 2-Year-Olds in the 1995 National Household Education Survey (NHES:95)	Kathryn Chandler
96-30 (Dec.)	Comparison of Estimates from the 1995 National Household Education Survey (NHES:95)	Kathryn Chandler
97-01 (Feb.)	Selected Papers on Education Surveys: Papers Presented at the 1996 Meeting of the American Statistical Association	Dan Kasprzyk
97-02 (Feb.)	Telephone Coverage Bias and Recorded Interviews in the 1993 National Household Education Survey (NHES:93)	Kathryn Chandler
97-03 (Feb.)	1991 and 1995 National Household Education Survey Questionnaires: NHES:91 Screener, NHES:91 Adult Education, NHES:95 Basic Screener, and NHES:95 Adult Education	Kathryn Chandler
97-04 (Feb.)	Design, Data Collection, Monitoring, Interview Administration Time, and Data Editing in the 1993 National Household Education Survey (NHES:93)	Kathryn Chandler
97-05 (Feb.)	Unit and Item Response, Weighting, and Imputation Procedures in the 1993 National Household Education Survey (NHES:93)	Kathryn Chandler
97-06 (Feb.)	Unit and Item Response, Weighting, and Imputation Procedures in the 1995 National Household Education Survey (NHES:95)	Kathryn Chandler
97-07 (Mar.)	The Determinants of Per-Pupil Expenditures in Private Elementary and Secondary Schools: An Exploratory Analysis	Stephen Broughman
97-08 (Mar.)	Design, Data Collection, Interview Timing, and Data Editing in the 1995 National Household Education Survey	Kathryn Chandler

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97-09 (Apr.)	Status of Data on Crime and Violence in Schools: Final Report	Lee Hoffman
97-10 (Apr.)	Report of Cognitive Research on the Public and Private School Teacher Questionnaires for the Schools and Staffing Survey 1993-94 School Year	Dan Kasprzyk
97-11 (Apr.)	International Comparisons of Inservice Professional Development	Dan Kasprzyk
97-12 (Apr.)	Measuring School Reform: Recommendations for Future SASS Data Collection	Mary Rollefson
97-13 (Apr.)	Improving Data Quality in NCES: Database-to-Report Process	Susan Ahmed
97-14 (Apr.)	Optimal Choice of Periodicities for the Schools and Staffing Survey: Modeling and Analysis	Steven Kaufman
97-15 (May)	Customer Service Survey: Common Core of Data Coordinators	Lee Hoffman
97-16 (May)	International Education Expenditure Comparability Study: Final Report, Volume I	Shelley Burns
97-17 (May)	International Education Expenditure Comparability Study: Final Report, Volume II, Quantitative Analysis of Expenditure Comparability	Shelley Burns
97-18 (June)	Improving the Mail Return Rates of SASS Surveys: A Review of the Literature	Steven Kaufman
97-19 (June)	National Household Education Survey of 1995: Adult Education Course Coding Manual	Peter Stowe
97-20 (June)	National Household Education Survey of 1995: Adult Education Course Code Merge Files User's Guide	Peter Stowe
97-21 (June)	Statistics for Policymakers or Everything You Wanted to Know About Statistics But Thought You Could Never Understand	Susan Ahmed
97-22 (July)	Collection of Private School Finance Data: Development of a Questionnaire	Stephen Broughman

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97-24 (Aug.)	Formulating a Design for the ECLS: A Review of Longitudinal Studies	Jerry West
97-25 (Aug.)	1996 National Household Education Survey (NHES:96) Questionnaires: Screener/Household and Library, Parent and Family Involvement in Education and Civic Involvement, Youth Civic Involvement, and Adult Civic Involvement	Kathryn Chandler
97-26 (Oct.)	Strategies for Improving Accuracy of Postsecondary Faculty Lists	Linda Zimbler
97-27 (Oct.)	Pilot Test of IPEDS Finance Survey	Peter Stowe
97-28 (Oct.)	Comparison of Estimates in the 1996 National Household Education Survey	Kathryn Chandler
97-29 (Oct.)	Can State Assessment Data be Used to Reduce State NAEP Sample Sizes?	Steven Gorman
97-30 (Oct.)	ACT's NAEP Redesign Project: Assessment Design is the Key to Useful and Stable Assessment Results	Steven Gorman
97-31 (Oct.)	NAEP Reconfigured: An Integrated Redesign of the National Assessment of Educational Progress	Steven Gorman
97-32 (Oct.)	Innovative Solutions to Intractable Large Scale Assessment (Problem 2: Background Questionnaires)	Steven Gorman
97-33 (Oct.)	Adult Literacy: An International Perspective	Marilyn Binkley
97-34 (Oct.)	Comparison of Estimates from the 1993 National Household Education Survey	Kathryn Chandler
97-35 (Oct.)	Design, Data Collection, Interview Administration Time, and Data Editing in the 1996 National Household Education Survey	Kathryn Chandler
97-36 (Oct.)	Measuring the Quality of Program Environments in Head Start and Other Early Childhood Programs: A Review and Recommendations for Future Research	Jerry West

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97-38 (Nov.)	Reinterview Results for the Parent and Youth Components of the 1996 National Household Education Survey	Kathryn Chandler
97-39 (Nov.)	Undercoverage Bias in Estimates of Characteristics of Households and Adults in the 1996 National Household Education Survey	Kathryn Chandler
97-40 (Nov.)	Unit and Item Response Rates, Weighting, and Imputation Procedures in the 1996 National Household Education Survey	Kathryn Chandler
97-41 (Dec.)	Selected Papers on the Schools and Staffing Survey: Papers Presented at the 1997 Meeting of the American Statistical Association	Steve Kaufman
97-42 (Jan. 1998)	Improving the Measurement of Staffing Resources at the School Level: The Development of Recommendations for NCES for the Schools and Staffing Survey (SASS)	Mary Rollefson
97-43 (Dec.)	Measuring Inflation in Public School Costs	William J. Fowler, Jr.
97-44 (Dec.)	Development of a SASS 1993-94 School-Level Student Achievement Subfile: Using State Assessments and State NAEP, Feasibility Study	Michael Ross
98-01 (Jan.)	Collection of Public School Expenditure Data: Development of a Questionnaire	Stephen Broughman
98-02 (Jan.)	Response Variance in the 1993-94 Schools and Staffing Survey: A Reinterview Report	Steven Kaufman
98-03 (Feb.)	Adult Education in the 1990s: A Report on the 1991 National Household Education Survey	Peter Stowe
98-04 (Feb.)	Geographic Variations in Public Schools' Costs	William J. Fowler, Jr.

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98-06 (May)	National Education Longitudinal Study of 1988 (NELS:88) Base Year through Second Follow-Up: Final Methodology Report	Ralph Lee
98-07 (May)	Decennial Census School District Project Planning Report	Tai Phan
98-08 (July)	The Redesign of the Schools and Staffing Survey for 1999-2000: A Position Paper	Dan Kasprzyk
98-09 (Aug.)	High School Curriculum Structure: Effects on Coursetaking and Achievement in Mathematics for High School Graduates—An Examination of Data from the National Education Longitudinal Study of 1988	Jeffrey Owings
98-10 (Aug.)	Adult Education Participation Decisions and Barriers: Review of Conceptual Frameworks and Empirical Studies	Peter Stowe
98-11 (Aug.)	Beginning Postsecondary Students Longitudinal Study First Follow-up (BPS:96-98) Field Test Report	Aurora D'Amico
98-12 (Oct.)	A Bootstrap Variance Estimator for Systematic PPS Sampling	Steven Kaufman
98-13 (Oct.)	Response Variance in the 1994-95 Teacher Follow-up Survey	Steven Kaufman
98-14 (Oct.)	Variance Estimation of Imputed Survey Data	Steven Kaufman
98-15 (Oct.)	Development of a Prototype System for Accessing Linked NCES Data	Steven Kaufman
98-16 (Dec.)	A Feasibility Study of Longitudinal Design for Schools and Staffing Survey	Stephen Broughman
98-17 (Dec.)	Developing the National Assessment of Adult Literacy: Recommendations from Stakeholders	Sheida White

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1999-03 (Feb.)	Evaluation of the 1996-97 Nonfiscal Common Core of Data Surveys Data Collection, Processing, and Editing Cycle	Beth Young
1999-04 (Feb.)	Measuring Teacher Qualifications	Dan Kasprzyk
1999-05 (Mar.)	Procedures Guide for Transcript Studies	Dawn Nelson
1999-06 (Mar.)	1998 Revision of the Secondary School Taxonomy	Dawn Nelson
1999-07 (Apr.)	Collection of Resource and Expenditure Data on the Schools and Staffing Survey	Stephen Broughman
1999-08 (May)	Measuring Classroom Instructional Processes: Using Survey and Case Study Fieldtest Results to Improve Item Construction	Dan Kasprzyk
1999-09a (May)	1992 National Adult Literacy Survey: An Overview	Alex Sedlacek
1999-09b (May)	1992 National Adult Literacy Survey: Sample Design	Alex Sedlacek
1999-09c (May)	1992 National Adult Literacy Survey: Weighting and Population Estimates	Alex Sedlacek
1999-09d (May)	1992 National Adult Literacy Survey: Development of the Survey Instruments	Alex Sedlacek
1999-09e (May)	1992 National Adult Literacy Survey: Scaling and Proficiency Estimates	Alex Sedlacek
1999-09f (May)	1992 National Adult Literacy Survey: Interpreting the Adult Literacy Scales and Literacy Levels	Alex Sedlacek
1999-09g (May)	1992 National Adult Literacy Survey: Literacy Levels and the Response Probability Convention	Alex Sedlacek

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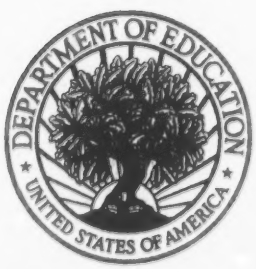
1999-11 (May)	Data Sources on Lifelong Learning Available from the National Center for Education Statistics	Lisa Hudson
1999-12 (June)	1993-94 Schools and Staffing Survey: Data File User's Manual, Volume III: Public-Use Codebook	Kerry Gruber
1999-13 (June)	1993-94 Schools and Staffing Survey: Data File User's Manual, Volume IV: Restricted-Use Codebooks: Principals, Schools, and Teachers	Kerry Gruber
1999-14 (June)	1994-95 Teacher Followup Survey Data File User's Manual: Restricted-Use Version	Kerry Gruber
1999-15 (June)	Projected Postsecondary Outcomes of 1992 High School Graduates	Aurora D'Amico
1999-16 (June)	Measuring Resources in Education: From Accounting to the Resource Cost Model Approach	William J. Fowler, Jr.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